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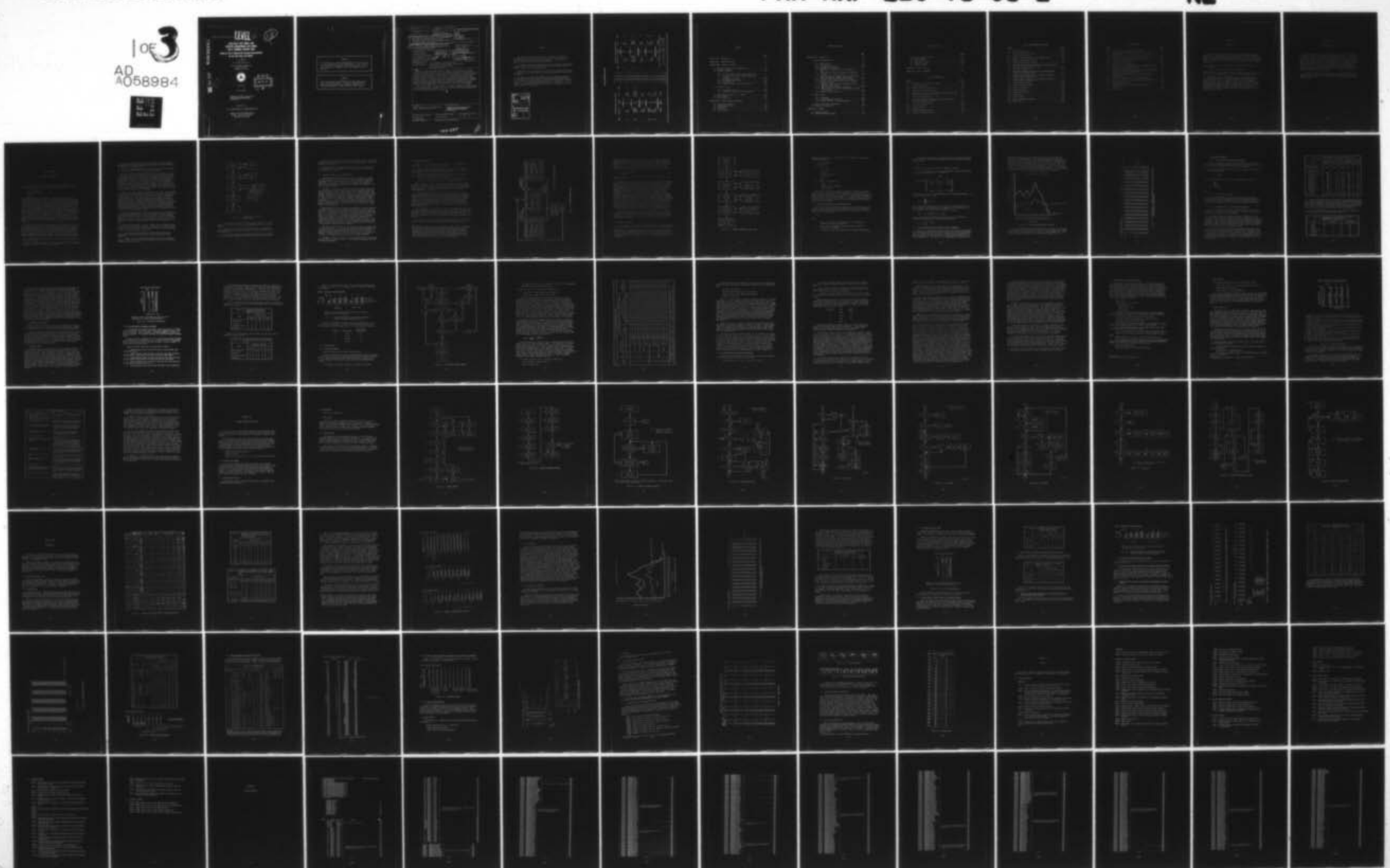

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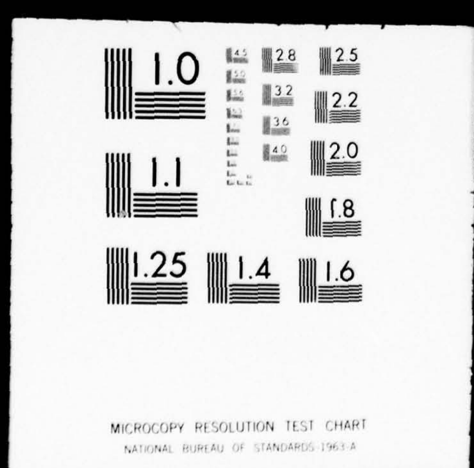

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LEVEL III

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USER DELAY COST MODEL AND FACILITIES MAINTENANCE COST MODEL FOR A TERMINAL CONTROL AREA

Volume II: User's Manual and Program Documentation for the User Delay Cost Model

L. B. Greene
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MAY 1978

FINAL REPORT

Prepared for

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16. Abstract

The User Delay Cost Model (UDCM) is a Monte Carlo simulation of certain classes of movement of air traffic in the Boston Terminal Control Area (TCA). It incorporates a weather module, an aircraft generation module, a facilities module, and an air control module to simulate delays, resulting from facility outage, imposed on four user classes: Air Carrier, Air Taxi, General Aviation, and Military Aircraft. The model can also be used to measure delays due to changing aircraft arrival rates, weather and other environmental considerations, approach types available, or any other factor that affects trail separation in final approach of the maximum number of aircraft an air controller can handle.

This is the second of three volumes. Volume I documented the model formulation and demonstration. Volume III is a user's manual and program documentation for the facilities maintenance cost model.

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PREFACE

The Federal Aviation Administration is responsible for operating and maintaining the airway facilities of the National Aviation System. The magnitude of annual operating and maintenance costs is such that means for reducing these costs are being sought.

This report documents the results of a study to model the relationship between airway facility maintenance practices and (1) aircraft delays in terminal areas, and (2) maintenance costs.

These models are intended to serve as tools for estimating the impact on system users and system operators of proposed maintenance cost reduction initiatives.

The models were formulated, demonstrated, and documented by ARINC Research Corporation under contract to the Transportation Systems Center. Mr. F. Frankel of the Transportation Systems Center provided the technical guidance. The dedication and expertise of Mr. L. B. Greene, Dr. J. Witt, and Mr. M. Sternberg-Powidzki of ARINC Research is acknowledged to be the major contribution to this work.

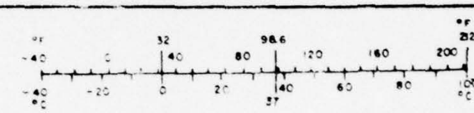
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



CONTENTS

CONTENTS (continued)

CONTENTS (continued)

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (continued)

LIST OF TABLES

CHAPTER ONE

INTRODUCTION

The User Delay Cost Model (UDCM) is one of two programs prepared by ARINC Research Corporation for the DOT/Transportation Systems Center (TSC) under Project Number TSC/420-0137-WD. The purpose of the two programs or models is to provide the FAA Airway Facilities organization with management tools to estimate the effect of variations in airway facilities maintenance scenarios on:

Costs to the user community due to excessive delays caused by facility outage

Costs of preventive and corrective maintenance.

The UDCM is to be used to address the first issue, while the companion model, the Facilities Maintenance Cost Model (FMCM), addresses the second.

This report provides the documentation of the UDCM, including a description of the model, a program description, and an example application of the model. It is the second of three reports prepared under contract to TSC. The first report, entitled "User Delay Cost Model and Facilities Maintenance Cost Model for a Terminal Control Area", provides documentation of the entire model development efforts. The third report, entitled "Users' Manual and Program Documentation for the Facilities Maintenance Cost Model", provides data on the FMCM, comparable to that contained in this report.

CHAPTER TWO

PROBLEM DESCRIPTION

The FAA is currently spending $1,000,000 a day, principally for labor, to maintain the facilities of the National Airways System. It was recognized that economies should be possible, particularly in the area of changing personnel and preventive maintenance policies, but that these economies might have an adverse effect on facility availability. If facility availability were reduced, an impact could be felt by the user community (defined here as air carriers, air taxis, general aviation, and military) in the form of delays over and above those attributable solely to weather and schedule. The UDCM is designed to measure these delays as the various navigation and landing aids and other facilities in a Terminal Control Area (TCA) fail and are restored to service.

The Boston TCA was used to provide guidance in the development of this model. However, the model is constructed in such a way that by changes in appropriate input data it can be made to reflect the characteristics of any comparable TCA.

CHAPTER THREE

METHOD OF SOLUTION

The UDCM is a Monte Carlo simulation model that combines the three primary stochastic processes that induce user delays:

Facility outage

Traffic intensity

Weather.

The underlying premise of the model is that these three factors are intrinsically interrelated in the creation of delay and that the only way delay can be attributed to any one is to hold two constant and measure the differential delay caused by variations of the third. *Differential delay* associated with a facility outage depends not only on the change of facility status but also on the existing weather conditions and traffic intensity. The weather and levels of aircraft activity can be set in any manner, but a large quantity of recent historical weather data for Boston's Logan Airport is already incorporated in the model. Several options are available for assessing the impact of facility outage. One or more facilities can be taken out of the system, e.g., the Airport Surveillance Radar (ASR), to determine the consequences of their being inoperative. An alternative method would be to assign values of Mean Time Between Outages (MTBO) and Mean Time To Restore (MTTR) to all facilities simulated in the model and let the model treat the outage and restoration times as random variables.

The model logic duplicates the complex rules and procedures that govern the movement of aircraft as a function of the aircraft traffic intensity, the status of FAA facilities, and the prevailing weather. An aircraft is generated at the boundary of the Boston TCA (at one of five holding fixes about 40 miles from the airport), and its movement from there to Logan or one of the secondary airports is simulated. For aircraft landing at Logan, a randomized time delay is used to schedule a subsequent departure. Aircraft departing from secondary airports are not simulated in the model.

The basic questions that the model is concerned with in moving an aircraft are as follows:

a. Will aircraft separation exceed the instantaneous traffic-handling capability of a controller (controller capacity)?

b. Will aircraft separation be in conformance with FAA standards? The answer to this question is dependent on the status of FAA facilities, the weather, and aircraft weight.

c. Can the aircraft land? The answer to this question is dependent on the status of FAA approach facilities and the weather.

As will be shown in the ensuing discussions of the model, there are a large number of detailed conditions or factors that must be considered in resolving these three key questions. For example, the aircraft type and approach category are needed to establish separation criteria, as are minimum weather conditions for landing. There are also many runways, combinations of facilities, and geographical factors to be considered. The model has been developed to consider the above issues in some detail. To expedite the model development and its execution time, however, it was decided not to simulate every step-by-step command (e.g., heading vectors) that a controller issues to an aircraft but rather the overall set of rules being followed in generating these commands.

Figure 3-1 is a generalized flow diagram for the UDCM. It illustrates the logical relationships among the main decision processes and files that constitute the model. More detailed discussions of these model elements are presented in the following paragraphs. As in nature, the weather assumes a major role. The state of the weather determines directly the level of air activity, especially among general aviation users. This is true because the level of general aviation activity declines during actual instrument conditions. Furthermore, wind direction and speed determine, in main part, the runway in use. The runway choice influences the types of approach available, which, interacting with the weather, determines the landing minima. For these reasons, Figure 3-1 shows weather generation as the first, or driving, model element.

The second program element is aircraft generation. This consists of determining, by random processes, and as a function of weather conditions (IFR or VFR) and time of day, the time of creation of the next arriving aircraft, its type (air carrier, air taxi, general aviation, or military), weight (small, large, or heavy), landing approach category (A, B, C, or D), destination, speed, and original position when first considered by the model.

The third program element, aircraft control, is more complex than the first two and is the heart of the model. It addresses, as a logical unit, the five questions that must be answered by tower and air control personnel in real life and by the model. These are:

What is the preferred landing or takeoff runway, taking into account wind speed and direction and other priorities, such as noise abatement?

If there are one or more instrument approaches for the preferred runway, is there at least one instrument approach for which all facilities required for landing are "up"?

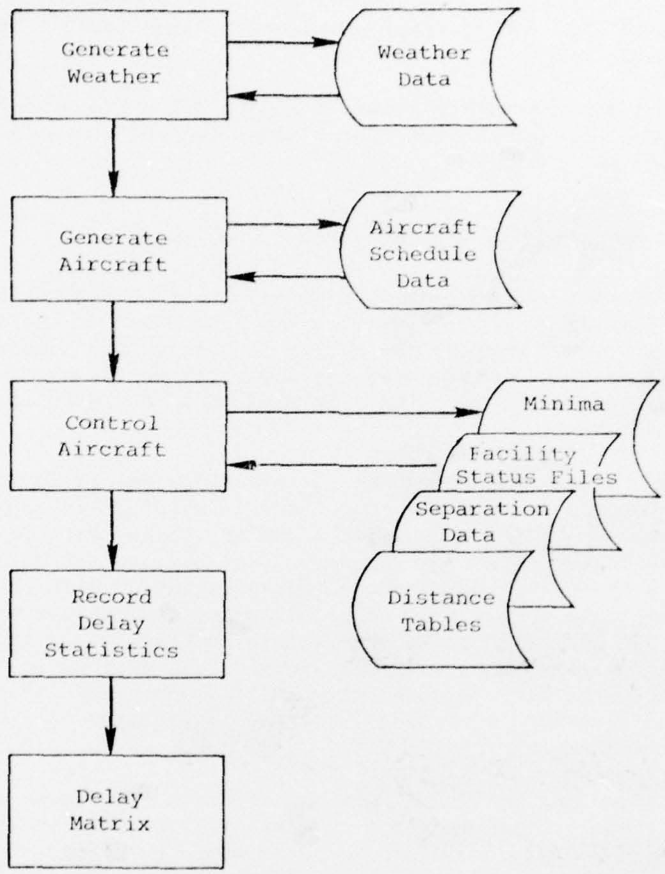


Figure 3-1. GENERALIZED FLOW CHART FOR THE UDCM

Is the weather such that, for the preferred runway, it is above minima for at least one of the available approaches for the preferred runway?

Having a runway and usable instrument approach, how should the aircraft be moved to the runway and proper separation established in the final approach?

For aircraft taking off from Logan, how should proper separation be established between landing aircraft and other aircraft taking off?

There are, of course, many variations and details related to how these questions are dealt with and to other necessary program tasks. These are discussed in Section 3.4.

The remaining model elements shown in Figure 3-1 correspond to the input data required in the exercise of the model and the generation of the aircraft delay statistics.

3.1 OVERVIEW OF MODEL AND ITS CAPABILITIES

Although the model was developed to assess the impact of changing facility availabilities on user delays, it was recognized during model development that it would provide the ability to evaluate a number of additional issues as well. Therefore, the capabilities discussed in the following paragraphs should be kept in mind when the features of the model are being assessed.

The UDCM can be used to analyze the differential delays induced not only by facility outage but also by the effect of aircraft schedule and weather variations, as well as by a host of other related factors. For example, at Logan there is no ILS on runway 27. A typical question might be "What would be the delay impact of equipping runway 27 with an ILS?" All that is required to answer this question, using the present model, is to insert a set of ILS minima for a straight-in approach on 27 in the minima table. It is easy to extend this argument to "What would be the effect of replacing the ILS on runway 4R with a Category III ILS or the Microwave Landing System?" Here, too, all that is required is a simple change in the minima table.

Many other questions and issues may be addressed. In fact, anything that affects spacing in final approach, number of aircraft a controller can handle simultaneously, or minima can be examined by simple input-data changes. It is emphasized, however, that the model cannot determine what these data changes will be; this must be done by analysis external to the model. This being the case, the model could answer the question "What would be the benefit (as measured by aircraft delay reductions) of increasing the number of aircraft per controller from 10 to 20?", without regard for how it was to be done. If the savings were appreciable, this could be taken as justification to examine the feasibility of attempting to achieve this increased controller capacity.

The model can also serve as an aid in airport design and layout, such as runway orientation. In this use, in particular, accurate weather data are required for the weather module; but with such data, it would be possible to decide whether a runway array of (4,22), (15,33), (9,27), for example, is better than (5,23), (17,35), (11,22), where the numbers in parentheses are runway directions in tenths of degrees, magnetic.

The model is not all-encompassing, but enlarging the basic logic makes many new options possible at little cost in terms of incremental analysis and additional modeling.

3.2 WEATHER GENERATION

Figure 3-2 is a logic diagram of this module. The following set of assumptions were used in formulating this module.

> Weather phenomena are associated with the presence and movement of pressure systems. Wind direction and velocity are a direct consequence of these movements and are correlated with one another.
>
> Cloud cover and height are, through the movement of pressure systems, correlated with wind direction and velocity.
>
> Visibility is correlated with wind direction and ceiling height.
>
> There is a tendency to persistence in weather conditions.

These assumptions, while certainly not an exhaustive set, are deemed essential to a realistic model, or simulation, of weather phenomena (wind direction, velocity, ceiling, and visibility) in any locale. Fortunately, a good data base is available from Boston upon which a simulation of these phenomena can be based.*

The available data, samples of which are presented in Appendix A, consist of the frequencies of occurrence of wind direction, on a 16-point compass with associated frequencies of wind velocity, grouped as follows: 1 to 4, 5 to 9, 10 to 14, 15 to 29, and 30+ knots, as well as conditions of calm. For each wind direction-velocity combination, frequencies of occurrence of ceilings are provided. Ceilings are grouped as follows: 1000+, 600 to 900, 500, 400, 300, 200, and 100 feet. Visibilities are grouped as follows: 0 to 1/4, 5/16 to 1/2, 5/8 to 7/8, 1, 1-1/4 to 1-1/2, and 3+ nautical miles.

These frequencies are presented as conditional probabilities; thus they allow the calculation, by randomizing on the unit interval, of a particular wind direction; and, given the wind direction, a wind speed; and, given the wind direction and speed, a ceiling; and, given the wind direction and ceiling, a visibility. The data are presented to the computer through input matrices.

A related issue is when and how to simulate changes in the prevailing weather. Two studies, also performed by the National Climatic Center,

---

*A statistical summary prepared by the National Climatic Center, Asheville, North Carolina, "Special Ceiling-Visibility Wind Tabulation", was used for Boston. The period of observation was from January 1970 through December 1974. Observations were made for daytime hours at 1000, 1300, 1600, and 1900 Local Standard Time (LST), and for nighttime hours at 2200, 0100, 0400, and 0700 LST. The data are published in two separate sets of tables (night and day), each with 7304 observations.

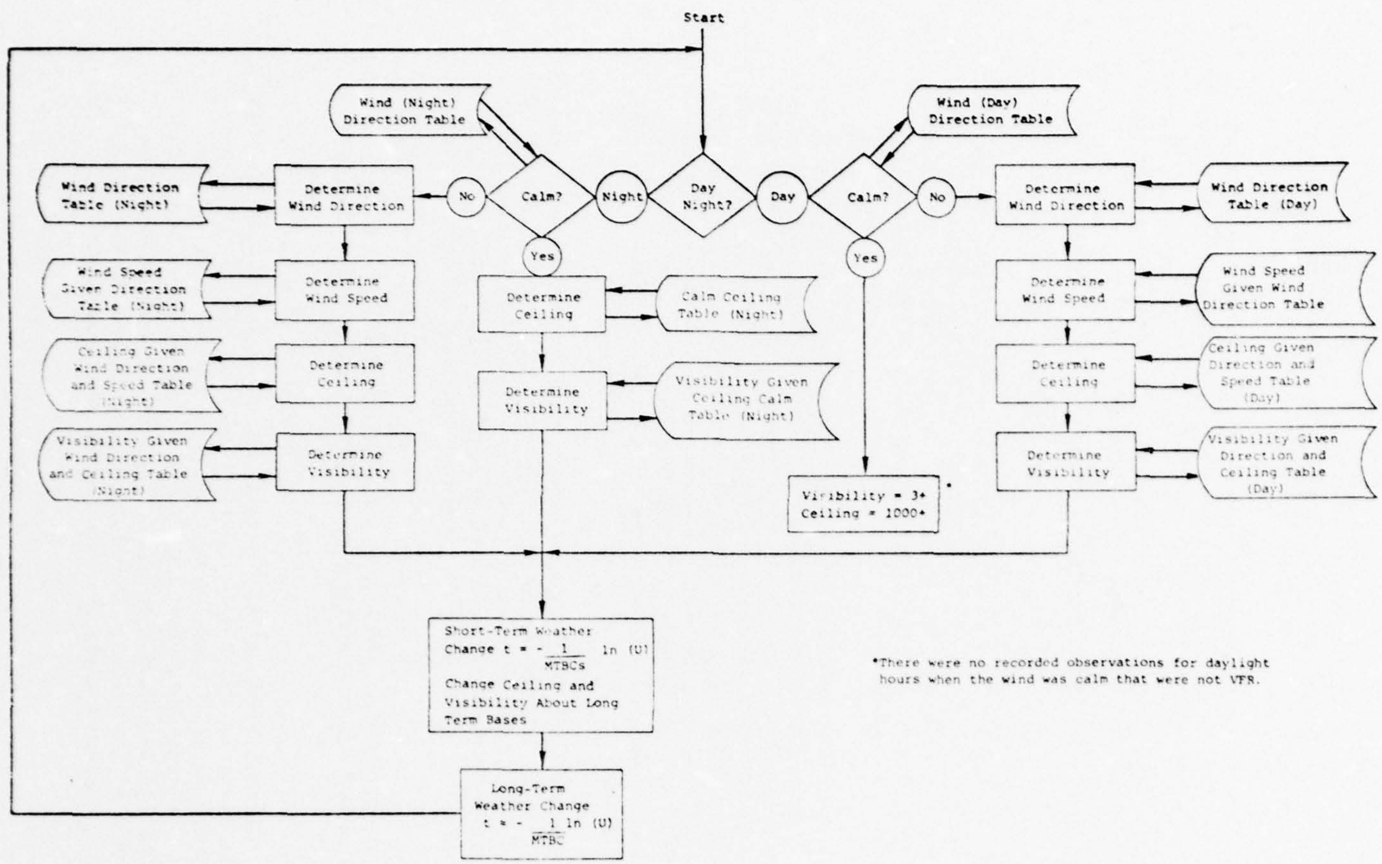


Figure 3-2. WEATHER MODULE LOGIC

suggested a basis for such simulation.* Under the assumption that wind direction and speed determine, in part at least, ceiling and visibility, the data provide a basis for answering the question of when to vary the weather. The wind persistence data fit an exponential decay curve fairly well with a Mean Time Between Changes (MTBC) of about 3 hours. The weather module, therefore, defines an exponentially distributed random variable called Time to Change the Weather. Its density function is

$$f(t) = \frac{1}{MTBC} e^{-t/MTBC}. \tag{3-1}$$

A nominal value of 3 hours for MTBC has been selected on the basis of these studies.

The question of how much to allow the weather to vary, once the time has been decided, is not so obvious and bears some discussion. In general, except when thunderstorms or strong fronts pass a station, the variation in wind and weather is gradual and highly correlated with past history. For example, an abrupt change from VFR to zero-zero would be rare. A completely realistic model would capture this historicity; however, the creation of such a model is not necessary. What is needed instead is a model that in the long run produces statistical similarity to the phenomena of interest. This has been done by merely allowing the weather to change randomly at the time selected, i.e., randomizing on the exponential Time to Change variable. As an added refinement, the model allows for small short-term variations. The model assumes that ceiling and visibility will vary uniformly about the basic "long term" values determined above. These "short term" variations are induced at times that are also exponentially distributed but with a nominal mean of 15 minutes. This is in conformance with observed short-term weather fluctuations and allows the model to simulate the conditions underlying a pilot's decision to wait for a short-term weather change if conditions are marginally below minima.

Figure 3-2 incorporates all of these weather factors. In the figure it can be seen that two sets of weather data tables, one each for night and day, are used in the model. The model checks the time first, then by a random process determines, in order, the wind direction, wind speed, ceiling, and visibility.

3.3 AIRCRAFT GENERATION

The objective of the aircraft generation module is to create aircraft to be routed through the Boston TCA in the exercise of the model. Figure 3-3

*The studies are "Seasonal and Annual Persistence of Surface Wind Direction by Wind Speed" at Binghamton, New York, for the period January 1960 to December 1964, with 24 observations per day; and "Duration of High Surface Wind Speeds" at Oscoda, Michigan AFB, for the period November 1950 to December 1970.

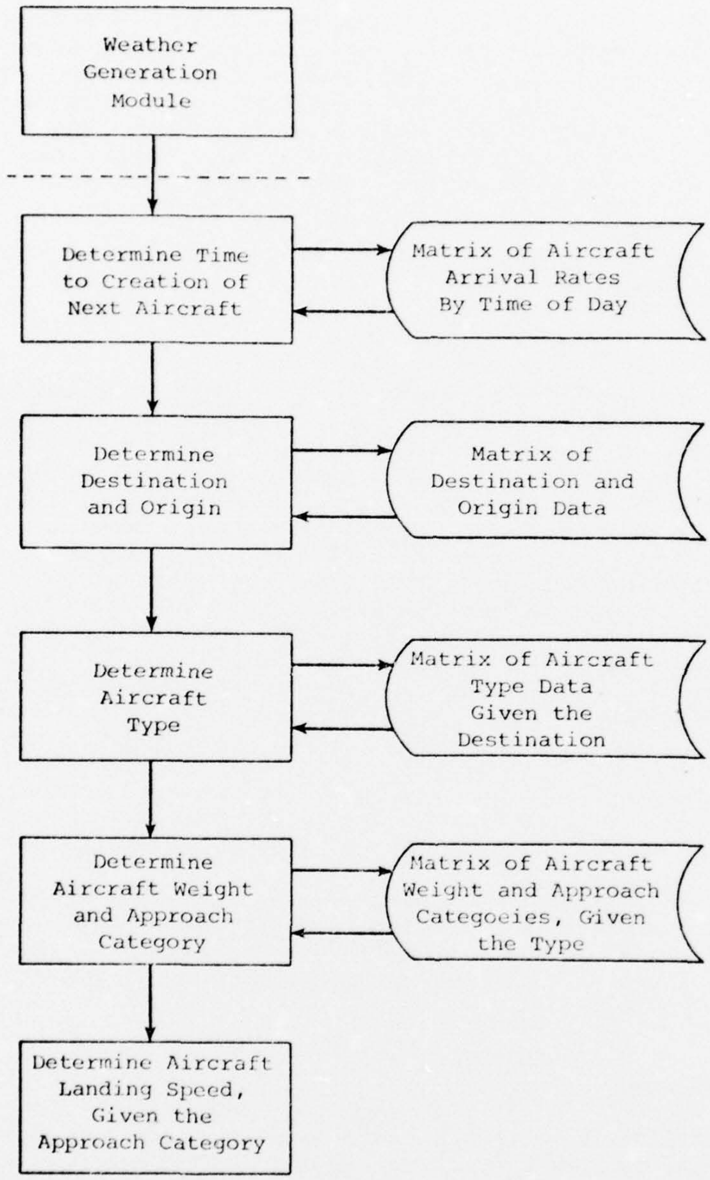


Figure 3-3. AIRCRAFT GENERATION MODULE LOGIC

displays the module logic. Each aircraft will be defined in terms of the following descriptors:

a. Time of creation

b. Destination

c. Type

   Air carrier

   Air taxi

   General aviation

   Military

d. Origin

e. Aircraft characteristics

   Weight

   Landing approach category

   Landing speed.

The following discussion explains two methods of simulating aircraft generation time. The first of these is a method that could be used if complete data were available. It is presented so that future data-gathering efforts by the FAA can be properly directed. The second method described is that which was actually used in the model. This method, though less direct, was considered necessary in order for the model demonstration to be representative and interpretable.

3.3.1 Aircraft Creation Time, Given Complete Data

The time to creation of the next aircraft will be considered a random variable having the exponential distribution, with the rate of creation a function of destination, time of day, and weather conditions. The rate of creation can be represented as

$$\lambda_{ijk},$$

where

i = 1,2,..,n the destination airport, and n is the number of destination airports in the model

j = 1,2,...,24 corresponding to the time periods 0000-0059, 0100-0159,..., 2300-2359

k = 0,1 where 0 implies IFR conditions and 1 implies VFR conditions.

The time of day influences the intensity of air activity into all airports in the model. Most of the secondary airports, for example, shut down at night, thus

$$\lambda_{ijk} = 0,$$

for values of j lying in the period of shutdown for airport i.

If k is assigned a value, say 0, corresponding to IFR conditions, then the λ_{ij0} can be arrayed in an n × 24 matrix.

$$\begin{array}{ll} & \quad\text{Time} \\ & \begin{array}{llll} \quad & 1, & 2, \ \ldots, & 24 \end{array} \\ \text{Destination} & \begin{bmatrix} 1 & \lambda_{1,1,0}, & \lambda_{1,2,0},\ldots, & \lambda_{1,24,0} \\ 2 & \lambda_{2,1,0}, & \lambda_{2,2,0},\ldots, & \lambda_{2,24,0} \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ n & \lambda_{n,1,0}, & \lambda_{n,2,0},\ldots, & \lambda_{n,24,0} \end{bmatrix}. \end{array}$$

For any time, e.g., j = 23, some airports will be closed and some open. If $\lambda_{i,23,0}$ is summed over i, then

$$\lambda_{.23,0} = \sum_{i=1}^{n} \lambda_{i,23,0},$$

and is the overall arrival rate to all airports in IFR conditions in the hour 2200-2259. The time of arrival (creation) of the next aircraft, t_a, has the exponential distribution with parameter $\lambda_{.,23,0}$

$$f(t_a) = \lambda_{.,23,0} \left[\exp -t_a \lambda_{.,23,0}\right],$$

and t_a can be found by sampling the unit interval for a uniformly distributed random variable, U, and solving the equation

$$t_a = \frac{-1}{\lambda_{.,23,0}} (\ell n\ U).$$

3.3.2 Aircraft Creation Time, Complete Data Not Available

Section 3.3.1 discussed how overall arrival rates could be calculated. The arrival rate data have not been collected in the form discussed there; that is, arrival rates for both weather conditions at all destination airports, by time of day, are not known. An approximation was used in the model demonstration. The source for this approximation was data from the

Performance Measurement System (PMS) for Airports, dated November 1975. Figure 3-4 was taken from this report and shows arrivals of scheduled aircraft as a function of time. This graph was converted by manual measurement into a table of approximate numbers. This table was extended quite arbitrarily to cover a 24-hour day. It was assumed that these rates could be made applicable to IFR or VFR conditions by multiplying them by a constant. This, in fact, was done in the demonstration runs. It is suggested that before the model is exercised for analysis that these data be collected in the form called for in the discussion contained in Section 3.3.1.

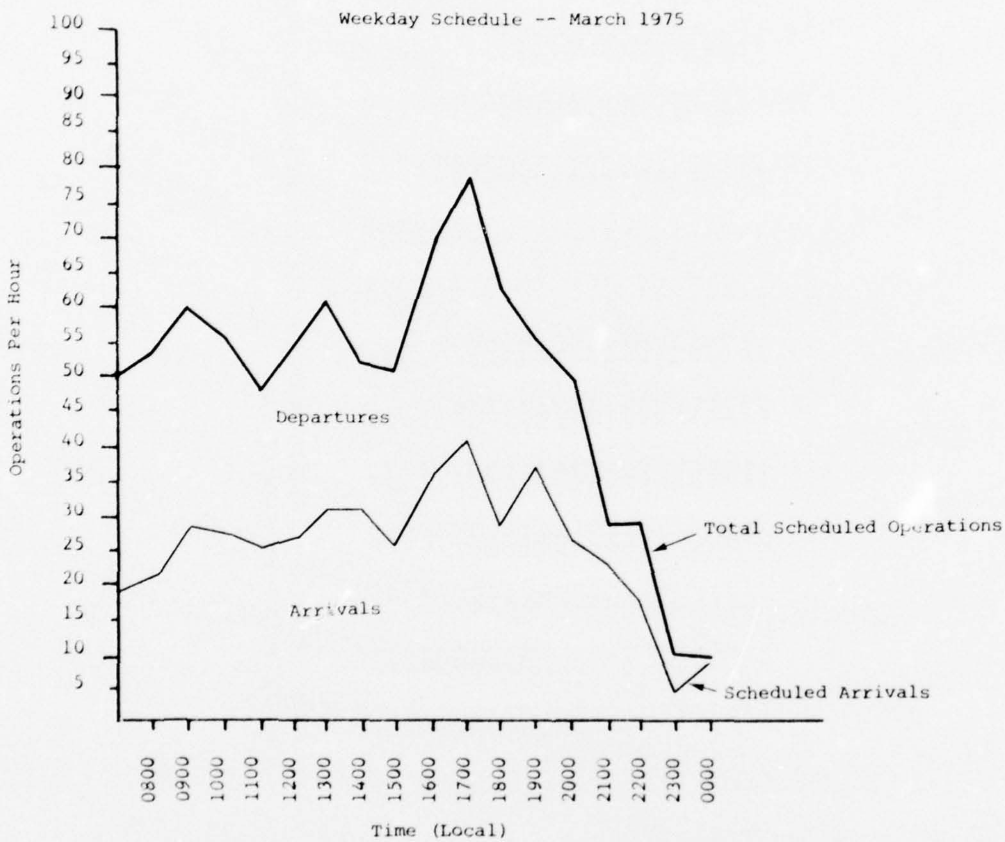


Figure 3-4. SCHEDULED ARRIVAL RATE AT LOGAN

The last column in Figure 3-5 shows the rate of arrival, derived from Figure 3-4, by time of day, for VFR conditions. These figures are the same as those used in the demonstration at TSC on 20-22 September 1976. Other uses of the matrix in Figure 3-5 are discussed in Section 3.3.3.2.

MATRIX HALFWORD SAVEVALUEVFRAC

	Hold Areas					Secondary Airports												Default to Tew Mac
	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ROW 1	297	597	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	7
2	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	[illegible]
3	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	[illegible]
4	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	8
5	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	11
6	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	17
7	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	25
8	260	522	740	784	871	871	871	954	955	955	955	955	955	998	998	1000	1000	30
9	251	502	711	752	836	929	946	947	948	954	954	955	955	996	997	998	999	41
10	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	40
11	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	39
Time of Day 12	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	40
13	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	46
14	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	46
15	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	40
16	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	53
17	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	60
18	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	43
19	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	53
20	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	46
21	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	33
22	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	26
23	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	7
24	269	538	763	807	897	997	997	997	998	998	998	998	998	998	998	1000	1000	12

Number of aircraft created in VFR conditions

Figure 3-5. DISTRIBUTION OF AIRCRAFT DESTINATIONS AND OVERALL ARRIVAL RATES AS A FUNCTION OF TIME OF DAY

3.3.3 Destination Assignment

3.3.3.1 Ideal Method of Destination Assignment

Just as the availability of the λ_{ijk} would have made the task of generating an arrival time simple and precise, it would also make the task of destination assignment simple and precise, as shown below.

Let P_i be the probability that the next aircraft will have airport i at its destination, then

$$P_i = \frac{\lambda_{ijk}}{\lambda_{.jk}} .$$

A table of cumulative values of P_i can be formed from the function

$$F_m = \frac{\sum_{i=1}^{m} \lambda_{ijk}}{\lambda_{.jk}} ,$$

where

$$m \leq n = \text{the number of airports} .$$

If a uniform random variable is again drawn from the unit interval, a destination is assigned by comparing U with this cumulative probability for all values of m. This method assures that aircraft will not be created with destination airports which are shut down because of time of day.

3.3.3.2 Pragmatic Method of Destination Assignment

Since the λ_{ijk} was not available, another method was used to take advantage of the data which were available. As will be seen, even with this method, the data were still incomplete.

The analysis, "FAA Air Traffic Activity for Calendar Year 1975", published by the FAA Office of Management Systems in March 1976, contained a number of statistical tables descriptive of various aircraft operations nationwide. Table 14 of this analysis identifies the number of instrument approaches handled by FAA-operated Approach Control Facilities, RAPCONS, and RATCCS. Table 3-1 is an extract from this FAA table and provides the data for Logan Airport and its secondary airports.

It can be seen that of the 31282 instrument approaches made in the Boston TCA, 26142 or 83.6 percent were made at Logan. At Bedford, 2902 or 9.3 percent instrument approaches were made, etc. A cumulative table was constructed to be used, in conjunction with a random number selection, to assign these destinations. Unfortunately, a similar table was not available for VFR approaches; therefore, the data in Table 3-1 were used for both cases.

Table 3-1. IFR APPROACHES IN THE BOSTON TCA FOR 1975					
Airport	Airport Totals	Air Carrier	Air Taxi	General Aviation	Military
Primary Airport (Boston Logan)	26142	20450	3012	2587	93
Secondary Airports					
Bedford	2902	87	235	2425	155
Beverly Municipal	548	0	1	446	101
Fitchburg	38	0	0	38	0
Fort Devens	26	0	0	1	25
Lawrence	200	0	38	162	0
Mansfield	12	0	0	12	0
Marshfield	19	0	0	19	0
Newburyport	1	0	0	1	0
Norwood	1275	2	12	1094	167
Plymouth	15	0	0	15	0
South Weymouth	69	0	0	12	57
Taunton	19	0	0	19	0
Tewkesbury	17	0	4	13	0
Area Totals	31283	20530	3302	6844	598

A further refinement was made in the model. Since aircraft bound for Logan appear at one of the five holding fixes situated around Logan, namely, Manjo, Millis, Bridgewater, Skipper, and Lawrence, and since their time of flight from the holding fix (an important program variable) is dependent on which fix they are leaving and to which runway they are proceeding, it is necessary to assign each aircraft created to one of these fixes.

For those aircraft destined for Logan, the percentages assigned to the five holding fixes are as presented in Table 3-2.

Table 3-2. PERCENTAGE OF AIRCRAFT BOUND FOR LOGAN ENTERING OVER HOLDING FIXES		
Fix	Fix Number	Percentage
Manjo	1	30
Millis	2	30
Bridgewater	3	25
Skipper	4	5
Lawrence	5	10

Combining these data with the percentages calculated from Table 3-1 shows that of all instrument approaches to be made in the Logan TCA (83.6 percent of the total), $0.3 \times 0.836 = .251$ will appear at Manjo and Millis; $0.25 \times 0.836 = .209$ at Bridgewater, etc. These numbers were then cumulated and are displayed in Figure 3-5. When all airports are open, between 0800 and 2000, .251 percent of IFR aircraft will appear at Manjo. In Figure 3-5, the unnumbered left column represents the time of day; column number 1 represents Manjo, column 2 is Millis, and so forth through column 5 (the order shown in Table 3-2). Consider, for example, row 13, representing the time from 1201 to 1300, where the number 251 represents the frequency, on a scale from 1 to 1000, of created IFR (or VRF) aircraft assigned to Manjo. Note that column 2 contains the value 502, which is the sum of 251 and 251, the latter number being the frequency of assignment to Millis. If a random number is drawn, e.g., 138, the aircraft would be assigned to Manjo. If it were 312, since $251 < 312 \leqslant 502$, it would indicate assignment to Millis. Each row is cumulative from left to right, where the columns from 6 through 17 represent, respectively, Bedford, Beverly, Fitchburg, Fort Devens, Lawrence, Mansfield, Marshfield, Newburyport (Plum Island), Norwood, Plymouth, South Weymouth, and Taunton. The last column, treated by the program as a default, is Tew-Mac and also shows the hourly rate of total arrivals.

3.3.4 Assignment of User Types

Having the destination, the user type can be assigned on the basis of the data in Table 3-1. Figure 3-6 shows the program selection matrix; its relationship to Table 3-1 is shown in the following program example.

Suppose the destination is Bedford, where 2902 is the total. Of these, 87 or 2.99 percent are air carriers, 235 or 8.09 percent are air taxis, 2425 or 83.56 percent are general aviation, and 155 or 5.34 percent are military. If these percentages are changed to numbers between 0 and 1000, the cumulative distribution is 30, 111, 947, and 1000. Row 6 of Figure 3-6 shows, for columns 1, 2, and 3, corresponding to air carrier, air taxi, and general aviation, respectively, the first three of these numbers. Military aircraft are treated as defaults.

3.3.5 Aircraft Origin

Aircraft proceeding to secondary airports are assumed to appear at the airport ready to land. The only question is whether or not they can, depending on facility status and weather conditions. On the other hand, aircraft destined for Logan appear at one of the five holding fixes that serve Logan -- Manjo, Millis, Bridgewater, Skipper, or Lawrence. For the purpose of the model configuration, these holding fixes are destinations from the point if view of creation, and are also origins of aircraft bound for Logan. No departures from secondary airports are simulated. Aircraft landing at Logan appear as Logan departures after a turnaround time is generated by the program function MODSP. At present, air carriers turn around uniformly in the interval of 10-15 minutes after landing, air taxis 180-240 minutes, general aviation 20-35 minutes, and military 240-300 minutes.

MATRIX HALFWORD SAVEVALUEVFRPT

A/C Destinations	ROW	COL. 1	2	3
	1	782	897	996
	2	782	897	996
	3	782	897	996
	4	782	897	996
	5	782	897	996
	6	30	111	947
	7	0	2	816
	8	0	0	1000
	9	0	0	38
	10	0	190	1000
	11	0	0	1000
	12	0	0	1000
	13	0	0	1000
	14	2	11	869
	15	0	0	1000
	16	0	0	174
	17	0	0	1000
	18	0	235	1000

A/C Type (Default = type 4)

Matrix is used to determine aircraft type once destination is known in VFR conditions.

Figure 3-6. USER TYPE BY DESTINATION

3.3.6 Aircraft Weight, Category, and Speed

With knowledge of the type of aircraft, three other pieces of information are required: the weight class, the aircraft approach category, and speed. The weight class is required to determine separation criteria in the final approach. The approach category is required to determine landing minima.

A small aircraft, designated S, is an aircraft whose maximum certified takeoff weight is 12,500 pounds or less. A large aircraft, L, weighs more than 12,500 pounds and no more than 300,000 pounds. A heavy aircraft, H, weighs more than 300,000 pounds.

Approach category definitions are tabulated as follows:

a. Landing approach speed less than 91 knots, landing weight less than 30,001 pounds

b. Landing approach speed 91 knots or more but less than 132 knots; landing weight 30,001 pounds or more but less than 60,001 pounds

c. Landing approach speed 121 knots or more but less than 141 knots; landing weight 60,001 pounds or more but less than 150,001 pounds

d. Landing approach speed 141 knots or more but less than 166 knots; landing weight 150,001 pounds or more

e. Landing approach speed greater than 166 knots is not considered.

Both weight class and approach category are treated as a function of aircraft type. The model assigns aircraft weight class and approach category through two separate random processes. Although there could theoretically be a high correlation between these two factors, the actual mix of aircraft is such that there is little need to correlate the weight class and approach category selection. For example, all general aviation aircraft in the available Logan data base were both small and approach category a. The only problem concerned commercial aircraft, wherein some heavy aircraft could be erroneously assigned to approach category c. However, a model refinement in this one area did not seem to be warranted.

Table 3-3 presents aircraft distribution data derived from information supplied by TSC, and based in part on FAA equipment forecast for air carrier operations at Logan.

Table 3-3. FREQUENCY DISTRIBUTION OF AIRCRAFT WEIGHT CLASSES

Type	Weight Class		
	Small	Large	Heavy
Air Carrier	0	.9	.1
Air Taxi	.1	.9	0
General Aviation	.9	.1	0
Military	.02	.9	.08

Table 3-4 presents approach category data which was also based on information supplied by TSC.

Table 3-4. LAND APPROACH CATEGORY DISTRIBUTION, BY TYPE

Type	Approach Category			
	A	B	C	D
Air Carrier	0	.05	.1	.85
Air Taxi	.9	.1	0	0
General Aviation	.9	.07	.03	0
Military	.1	.3	.3	.3

Table 3-3 is combined with Table 3-4 as a single input matrix, and is displayed in Figure 3-7. The data are shown as cumulative probability distributions.

MATRIX HALFWORD SAVEVALUECATWT

		COL. 1	2	3	4	5	6	7	
ROW	1	0	0	787	1000	0	787	1000	Air Carrier
	2	0	1000	1000	1000	0	1000	1000	Air Taxi
A/C	3	1000	1000	1000	1000	1000	1000	1000	General Aviation
Type	4	300	500	1000	1000	500	1000	1000	Military
		Approach Category				Weight Class			

Matrix is used to define aircraft category and weight, once type has been determined.

Figure 3-7. CUMULATIVE FREQUENCY DISTRIBUTION OF AIRCRAFT APPROACH CATEGORIES AND WEIGHT CLASSES

With weight and approach category decided, an approach speed is all that remains to be assigned. The speed is selected on the basis of a uniform speed distribution applicable to the various approach categories:

Category	Speed (Knots)	Distribution Range (Knots)
A	71-90	20
B	91-120	30
C	121-140	20
D	141-165	25

3.4 AIRCRAFT CONTROL

3.4.1 Air Traffic Control

Figure 3-8 depicts the air traffic control module.

As described previously, when an aircraft bound for Logan is generated, it is assigned to one of the five inbound holding fixes, where it is held until it can be accepted by a controller for vectors to an approach. A central assumption of this model is that three factors primarily affect delays:

- The number of aircraft a controller can handle at one time

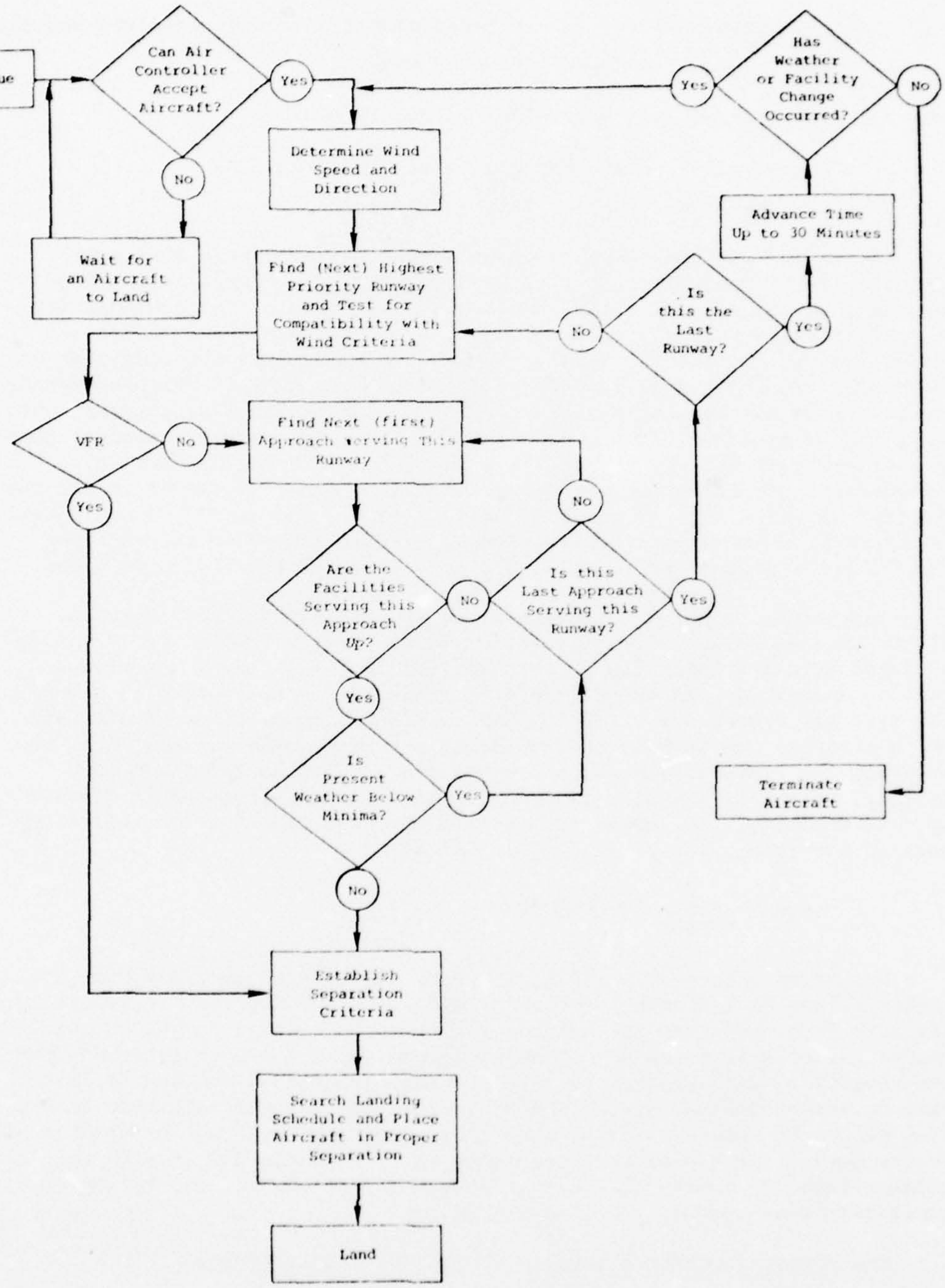


Figure 3-8. AIR TRAFFIC CONTROL MODULE

The longitudinal, or trail, separation of aircraft in final approach

Whether or not an approach can be made.

The number of aircraft per controller is determined by:

A controller's innate capability and training

Accuracy and information rate of the radar.

Interviews with personnel in Boston TRACON showed that while the capabilities of controllers varied considerably, an average controller, working with the ASR, ARTS-III, and SECRA all operable, could handle ten aircraft between the holding fixes and the point where the aircraft are handed over to the tower control. These same interviews revealed that as the several radars became inoperable (the Winthrop ARSR is included because its raw video can be displayed in the TRACON), the number of aircraft per controller diminished. The last column in Table 3-5 displays nominal numbers of aircraft per controller, as a function of the radar facility environment. To illustrate, suppose the ASR is down, the SECRA is up, the ARTS-III is down, and the Winthrop ARSR is down. The SECRA (beacon radar) is the only radar information available, and the number of aircraft per controller is reduced from a nominal, or average, value of ten to eight.

The manner in which the maximum number of aircraft per controller (MAPC) affects delay is readily seen. Assume that a controller is moving aircraft from a holding fix to a runway and that the runway acceptance rate is unlimited. If the distance from the fix to the runway is D and the aircraft speeds are S, define MAPC as the maximum number of aircraft per controller and NAPH as the number of aircraft moved per hour. If the aircraft the controller handles are assumed equally distant from one another, then this distance is D/MAPC. If the aircraft speed is divided by this quantity, the number of aircraft per hour that the controller can move to the runway, NAPH, is given; that is,

$$\text{NAPH} = \frac{\text{S}}{\text{D/MAPC}} = \frac{\text{(MAPC) (S)}}{\text{D}} .$$

For given values of S and D, the rate of removing aircraft from the holding fixes is a linear function of MAPC. If a controller is receiving aircraft from more than one holding fix, then the rate at which he can remove aircraft from any one of these (assuming they are equidistant from the runway) is NAPH/N, where N is the number of holding fixes. If this rate is less than the rate at which aircraft are arriving at these fixes, then queues or stacks will develop. The longer the queues, the greater will be the delay. If the runway acceptance rate if finite and if NAPH is greater than the runway acceptance rate, then, of course, the runway acceptance rate becomes the limiting factor.

The runway acceptance rate is controlled primarily by:

Trail separation in final approach

Runway clearance rate.

Table 3-5. AIRCRAFT SEPARATION TABLE

Row Number	Facility Status				Trail Separation Standards (Nautical Miles)						Number of Aircraft per Controller
					Nominal Separation (I)	Differentials (Add to Nominal Separation)*					
	ASR	SECRA	ARTS-III	ARSR		H,H** (II)	L,H** (III)	S,H** (IV)	L,L** (V)	S,L** (VI)	
1	Up	Up	Up	Up	3	1	2	3	0	1	10
2				Down	3	1	2	3	0	1	10
3			Down	Up	3	1	2	3	0	1	8
4				Down	3	1	2	3	0	1	8
5		Down	Up	Up	4	0	1	2	0	0	6
6				Down	4	0	1	2	0	0	6
7			Down	Up	4	0	1	2	0	0	6
8				Down	4	0	1	2	0	0	6
9	Down	Up	Up	Up	3	1	2	3	0	1	10
10				Down	3	1	2	3	0	1	10
11			Down	Up	5	0	0	1	0	0	8
12				Down	5	0	0	1	0	0	8
13		Down	Up	Up	5	0	0	1	0	0	5
14				Down	12	0	0	0	0	0	4
15			Down	Up	5	0	0	1	0	0	5
16				Down	12	0	0	0	0	0	4

*See Paragraph 1420, Air Traffic Control, 1770.65, 1 January 1976, FAA, Air Traffic Service.

**H,H means a heavy aircraft following a heavy; L,H means a large aircraft following a heavy, etc.

Trail separation in final approach, the only one of these two factors allowed to vary in the model, is controlled by several factors, among which are:

Accuracy of navigation

Precision and information rate of the radar

Separation required for wake-vortex avoidance

Runway clearance time.

Table 3-5 is also used by the model to determine separation. A nominal separation is given in column I as a function of radar status. If all radars are up, a nominal separation of 3 nautical miles is provided. Other radar outage combinations give different nominal separations up to a maximum of 5 nautical miles. In the event that all radars are down, radar vectors cannot be provided and the model acts as if any approach to Logan must be made on the Boston VORTAC. In this event, a nominal separation of 12 miles is called for. This is an approximation; it is understood that the actual separation in this case would be achieved by not clearing a following aircraft from a holding fix until the one ahead reports at some prescribed fix. The distance between the two aircraft would therefore be a variable dependent on the holding fix involved and the particular runway in use. The 12-nautical-mile separation is thought, however, to be an adequate approximation.

Columns II through VI of Table 3-5 are incremental separations that are added to the nominal separation determined by column I to provide wake-turbulence avoidance. For example, in the top row, with all radar equipment up, column IV represents a small aircraft following a heavy, and an additional 3-nautical-mile separation is provided, giving a total separation of 6 nautical miles.

The model utilizes the separation-table data to establish the landing sequence. How this sequencing is established is a key aspect of the model, as will be shown in Section 3.4.2. As mentioned earlier, in the description of the aircraft generation module, aircraft bound for Logan are placed at one of the five peripheral holding fixes for the purpose of determining the distance from the fix to Logan. It is not necessary, however, to establish five different queues in the model in order to simulate their handling. A single, first-in/first-out (FIFO) suffices. This reflects the fact that the two approach controllers are in communication with one another and coordinate their activity so that all aircraft handed off to them are allowed to proceed in approximately their order of appearance.

3.4.2 Runway Selection and Landing Sequencing

Before a simulated aircraft is released from the queue that represents the holding fixes, the following steps are taken:

The controllers must be free to handle the aircraft.

A runway is assigned, taking into account wind speed and direction, types of approach available, weather conditions, and facilities status.

When a runway is found, the distance to that runway from the assigned holding point is found in the distance table and, by use of the aircraft speed, a time of flight is calculated.

By summing the time of flight and present time, an ETA is found. This ETA is used to determine where the aircraft is placed in the landing sequence.

Runway selection is based on the current wind direction and speed coupled with a priority system. It also takes into account the status of facilities that define the several approaches available, the ceiling and visibility conditions, and landing minima. At Logan, the following landing runway priority system is used:

Priority	Day	Night
1	4R/L	33L
2	27-22L	4R
3	33R/L	22L
4	15R/L	

The model first makes a tentative runway selection by taking into account this priority system and wind constraints. It then determines whether or not a landing can actually be made on this runway under prevailing weather conditions and approach availability.

If the wind is 5 knots or less, it is assumed that the wind is calm, as is done at Logan. In this case the highest-priority runway is noted and a check is made, approach by approach, to determine if the facilities necessary for that approach are in an up status. As available approaches are found for the runway under consideration, the minima corresponding to each approach are examined. If the minima are lower than the prevailing ceiling and visibility conditions for that particular runway-approach combination, a viable approach exists and it is assumed that a landing can be made. If the first approach is not viable, the second is checked, and this cycle is continued until a viable approach is found or all approaches for that runway are exhausted. In this case, the next-lower-priority runway is examined. If no viable approach on any runway can be found, the aircraft is delayed at the holding fix until either a viable approach becomes available or 30 minutes have elapsed, at which time the aircraft is presumed to divert to its alternate.

If the wind is greater than 5 knots and is 15 knots or less, the highest-priority runway having the wind direction within ±80 of its direction is selected and tested for the availability of a viable approach. If no viable approach exists on this runway, the next-highest-priority runway is

examined, etc., until either a viable approach is found or the aircraft is forced to wait for a weather or facility status change to take place.

When the wind is greater than 15 knots, the runway priority is not considered. The model cycles through each runway, searching for a viable approach, if one or more runways are found having a viable approach, the runway closest to the wind is chosen, regardless of wind direction and speed. Of course, if no viable approaches are available, the aircraft, as before, stays at the holding fix.

All of these checks are made before the aircraft is released from the holding fix. When a runway and approach have been found, a distance table is entered. This table contains the distances in nautical miles from all five holding fixes to all the runways at Logan. The data were taken by direct measurement from the Boston (Logan International), Mass., ASR-7 60-nautical-mile video map prepared by the National Ocean Survey, revised 4 February 1976. The routes were laid out in conformity with the Boston Tower Standard Operating Procedures, dated 15 March 1976, BOS TWR 7110.35. It is understood that these routes vary in length from approach to approach, but the tabulated distances are believed to be representative.

When the distance is found, a time of flight is calculated. In calculating the time of flight, the model increases the landing speed by some factor greater than 1; e.g., in the delivered version of the UDCM, time of flight is set equal to the distance divided by the landing speed doubled. This time of flight is added to the present time to obtain an ETA.

Assuming that there are aircraft ahead of the one being considered, there is a landing schedule that contains the landing time, speed, and weight class of the aircraft already en route to land. The ETA of the present aircraft is compared with those of the aircraft on the landing schedule. When the aircraft just ahead (the lead aircraft, with a landing time just less than this ETA) is found, the required separation between the two aircraft is looked up (see Table 3-5) and a calculation is made, using the two aircraft's speeds, to determine if the ETA will allow proper separation. If it does, then a similar calculation is made for the next, or trail, aircraft on the landing schedule. If separation is assured, the ETA is assigned as the landing time and the aircraft is released from the holding fix. Once an aircraft is released, it will be assumed to land regardless of any subsequent changes in weather or facilities. If it does not clear the lead aircraft, a delay is calculated to assure separation, and a check is made on the trailing aircraft, using the ETA plus the calculated delay. If separation is assured, the landing time is the ETA plus this delay. If separation for the trail aircraft is not assured, it is then treated as the lead aircraft and the cycle is continued until a landing time is found. The difference between the landing time and the ETA is the delay time due to spacing. When a delay is necessary, the aircraft is not automatically released from the holding fix at the termination of the delay, but the whole cycle is repeated to ensure that no weather or facility changes have taken place and that the landing schedule has not changed. If the originally determined conditions continue to prevail, the aircraft is released at the end of its delay time and is assumed to land.

If a viable landing runway cannot be found, aircraft are held for up to 30 minutes, during which time the weather may change or facilities may be restored to service, which will allow landings to be made. If no landing is possible within 30 minutes, the aircraft is scrubbed, as if it were going to an alternate airport. Aircraft bound for secondary airports that cannot land are either scrubbed, as if they are going to another secondary airport, or they are diverted to Logan. An aribtrary proportion, one-half in the present model, are assigned to Logan. For those which are diverted to Logan, a distance table is entered to enable calculation of a time of flight. They are put on the landing schedule in the usual way, with one exception: they are assigned a higher priority than other inbound aircraft. This has the effect of putting them ahead of aircraft waiting to be released from the holding fixes.

At Logan, several different situations are encountered in the assignment of runways for takeoff and landing. These assignments are based on wind conditions and states of the weather. For example, if the wind is less than 15 knots and the weather is VFR, landings are permitted on certain runways intersecting the primary, or preferred, runway. Under these conditions the model sets up another landing schedule to which it assigns small aircraft, and the assumption is made that they land on schedule, with separation at the intersection being maintained by the tower. It is also assumed that when the wind is less than 15 knots, landings and takeoffs are scheduled on different runways and collision is avoided on the landing and takeoff runway intersections by tower action. On the other hand, when the wind is greater than 15 knots, landing and takeoffs will be taking place only on the primary runway, and all landings occur on the primary runway.

If the landing and takeoff runways are different, departing aircraft will be allowed to depart as soon as the first landing aircraft lands, unless the first landing aircraft is two miles or more out in final approach. In this case, the departing aircraft will be allowed to take off ahead of it, given proper separation from any aircraft taking off. In a nonradar (VORTAC only) environment, three-minute separation will be simulated.

If landings and takeoffs are occurring on the same runway, when the wind speed is greater than fifteen knots, the model will simulate a one-minute roll-out and runway clearance time for landing aircraft; i.e., departures will be permitted one minute after prior landing if the next landing aircraft is two or more miles out at runway clearance time. Aircraft taking off are assumed to be handed off to ARTCC immediately. Takeoff is not permitted if the ceiling is less than 375 feet and visibility is less than 1 mile.

When three or more aircraft are in the takeoff queue, aircraft coming off the holding fix will go to five-miles separation or more in final.

3.5 DATA REQUIRED TO EXERCISE THE MODEL

A key element in any simulation model is the input data base. The input data must be complete enough to reflect the elements being simulated, and they must be accurate if the model is to have predictive value. This section will identify the nature of the data necessary to exercise the UDCM. Chapter Five discusses and explains the data in greater detail, while Appendix A, the program listing, displays all of the input data matrices with specific numerical values used during the model demonstration. Some of the data appearing in Chapter Five has already been presented in the previous discussions. The input data required by the model fall into the following categories:

Weather data

Arrival rates as a function of:

Destination*

Weather, VFR or IFR

Time of day

Distribution of aircraft types (air carrier, air taxi, general aviation, military) as a function of weather (VFR, IFR) and destination

Distribution of weight class as a function of type

Distribution of approach category as a function of type

Turnaround time as a function of type

Distribution of holding-fix assignment, e.g., percentage of Logan-bound aircraft coming in over each of the five holding fixes

Distances from holding fixes to the primary airport under radar and nonradar (VORTAC) environment, by runway

Minima for each approach serving each runway, by approach category

Identity of all facilities necessary for each approach at each runway

MTBF and MTTR of each facility for the Facility Status File

Trial separations required in landing as a function of radar/VORTAC outage and leading/following aircraft weight classes, and maximum number of aircraft per controller as a function of radar outage

Airport description data

Turnaround times for landing aircraft by type.

*Note the discussion in Section 3.3.3.1.

3.6 MODEL OUTPUTS

The program produces and prints out three kinds of data:

Output data of the run, i.e., delay data of various kinds

Program administrative data*

Current values of program parameters*.

Run delay output data are presented in the form of a computer-printed matrix, an annotated example of which is shown in Figure 3-9. This matrix gives an overall synopsis of the model's operation. The four columns in this matrix signify aircraft type. Column 1 represents air carriers, Column 2 air taxis, Column 3 general aviation, and Column 4 military aircraft. The delay measures, with amplifying comments, are presented in Table 3-6.

3.7 MODEL LIMITATIONS

The model has several limitations, some minor, some larger in scope. The development effort was subject to constraints on time and money. The model development began with an identification of the possible features that could be included in the model. Then the time and budget constraints were used in formulating the required model limitations and basic assumptions. To illustrate the sort of questions considered, the issue of incorporating collision-avoidance logic in the route network was examined. Conversations with TSC personnel and persons in the academic community indicated that this would be a very extensive and unnecessary undertaking; it was therefore abandoned in favor of a simpler concept, namely, that "The aircraft will be assumed to be separated by the controller".

Another question was whether or not to simulate traffic through the TCA, understood to be a very large burden on the air controller. It was decided, however, that the first order of priority was what happened at Logan and, more particularly, what happened to aircraft landing at Logan. This priority also dictated the decision to assume that aircraft taking off from Logan are simply handed off to the Boston Center, thus disappearing from the model.

Secondary airport operations are dealt with in very simple fashion. The major simplifications are:

Aircraft appear at the airport at time of creation, rather than at the TCA boundary.

Takeoffs are not simulated at all.

The effect of secondary traffic in the Boston Sector on controller capacity is neglected.

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*These outputs are explained in Chapter Five, Section 5.2.

MATRIX HALFWORD SAVEVALUEDELAY

ROW (See accompanying explanation of rows)	COL. 1	2	3	4
1	515	64	160	12
2	514	56	87	8
3	0	0	21	4
4	0	0	462	83
5	356	33	60	4
6	7419	801	1418	91
7	4694	629	968	49
8	51	9	6	2
9	462	47	81	6
10	346	29	56	2
11	1252	80	153	2
12	39	2	4	0
13	461	44	81	2

Aircraft Type

1. Number of aircraft created at holding fixes and secondary airports
2. Number of aircraft originally scheduled to the primary airport through the holding fixes
3. Number of aircraft diverted from secondary airport to primary airport
4. Time of flight accumulated by secondary-airport aircraft diverted to the primary airport
5. Number of aircraft landing at primary airport that experienced delay
6. Total delay of landing aircraft
7. Total delay accumulated, for both landing and diverting aircraft, due to separation criteria
8. Number of aircraft not able to land at primary airport and diverted
9. Number of aircraft that landed at primary airport
10. Number of aircraft that experienced takeoff delay at primary airport
11. Total takeoff delay time
12. Total takeoff delay time experienced by aircraft at head of takeoff queue waiting to achieve separation on aircraft taking off ahead
13. Number of aircraft entering the takeoff queue.

Figure 3-9. OUTPUT DELAY MATRIX

The reasons for a simplified secondary airport model are, as explained previously, the constraints of limited time and money, and the fact that the Logan events were considered paramount. All of these elements can be added to the model incrementally.

The placement of aircraft in the landing schedule does not take into account a system of priorities based on aircraft speed and weight. It is recognized that in practice the controllers do take these factors into account, but in a way that reflects the extreme complexity of the human decision process. Refinement is possible in this area.

Table 3-6. EXPLANATION OF DELAY MEASURES

Delay Measure	Comment
1. Number of aircraft created at holding fixes and secondary airports.	This is simply the sum of all aircraft-creation events in the program.
2. Number of aircraft originally scheduled to the primary airport through the holding fixes.	This number is contained in the total shown in line 1.
3. Number of aircraft diverted from secondary airports to primary airport.	When weather is below minimum at secondary airports, 50% divert to Logan. They are assigned a higher priority for air controller pick-up than aircraft at the holding fixes.
4. Time of flight accumulated by secondary-airport aircraft diverted to the primary airport.	A distance table in the program contains the distance from each secondary airport to the primary airport. When a diversion to Logan takes place, the time of flight is calculated. Line 4 is the sum of these times.
5. Number of aircraft landing at primary airport that experienced delay.	Delay is defined as the difference between time of creation plus time of flight and landing time. This line shows the number of aircraft for which this difference was not zero.
6. Total delay of landing aircraft	This is the sum of delay times experienced by aircraft delayed (reported in line 5).
7. Total delay accumulated, for both landing and diverting aircraft, due to separation criteria	The ETA is the sum of the time of acceptance by a controller and the time of flight. If the ETA will not fit the landing schedule, a later scheduled landing time is found. The difference is delay due to spacing. An aircraft may not be able to leave the holding fix at the end of its separation delay; a facility may have gone down in the interim. If it cannot leave the fix within 30 minutes, it diverts. Thus it is possible for both landing and diverting aircraft to accumulate spacing delays.
8. Number of aircraft not able to land at primary airport and diverted	If an aircraft is not released from a holding fix within 30 minutes of its creation time, it is assumed to divert. It is possible for an aircraft previously diverted to Logan from a secondary airport to subsequently be diverted from the primary airport.
9. Number of aircraft that landed at primary airport	This is the total number of aircraft landing at the primary airport. It includes aircraft previously diverted from secondary airports.
10. Number of aircraft that experienced takeoff delay at primary airport	Since takeoffs from secondary airports are not simulated in the model, this measure is applicable only to the primary airport. Delay here is defined as the difference between the time the aircraft enters the takeoff queue and its actual time of departure.
11. Total takeoff delay time	This is the sum of the delay times for all aircraft delayed taking off.
12. Total takeoff delay time experienced by aircraft at head of takeoff queue waiting to achieve separation on aircraft taking off ahead	If an aircraft otherwise ready for takeoff is delayed because the aircraft taking off ahead has not achieved proper time separation (1 minute in radar environment, 3 minutes in non-radar environment), it is delayed until this separation is assured.
13. Number of aircraft entering the takeoff queue	After an aircraft lands at the primary airport, it is assigned a random turnaround time. At this time it enters the takeoff queue. This measure is the total number of aircraft entering this queue. This line was not available for runs 1 through 5.

There is no provision in the model for the effect of deterioration in the quality of voice radio communications. Quantification of this phenomenon is the subject of a more sophisticated and extensive form of analysis, which has not been undertaken.

An important meteorological phenomenon is the cloud deck between 1000 and 3000 feet. A descent through such a deck must be IFR, and an IFR approach must be made to landing. The model does not recognize this, simply because data relating to the distribution of this condition were not known. The impact of this limitation is that IFR approaches are made less frequently by the model than in reality. Acquiring data for the weather module was a major source of delay in model development. Given more complete weather data, this limitation can be easily overcome.

The model is programmed in General Purpose Simulation System (GPSS) language. The basic cycling interval for the UDCM is one minute. This means that every clock GPSS pulse is interrupted as one minute of simulated real time. The use of a one-minute clock implies an analytical error in calculation because all calculations involving time are integer quantities. For example, any calculation, such as a distance divided by a speed, will truncate downward to the next lower integer so that, say, all times between 4.0 and 4.999 minutes will be interpreted as 4 minutes. Thus the same time of flight would be obtained over a range of distances and/or velocities. Obviously, then, some error is built into the model. This could be reduced by allowing one clock pulse to stand for 0.1 or 0.01 minute, or any other fraction of a minute. Such reduction would, however, increase the model's already very tight core constraints since, in order to obtain runs of any reasonable simulated duration, the halfword savevalues and matrices would have to be increased to fullword values.

In summary, it is believed that the limitations noted are important but that the model does handle the first-order effects and that, given the modular construction and central logic, second-order effects can easily be incorporated later.

CHAPTER FOUR

GENERAL PROGRAM DESCRIPTION

This section provides the program description, the operating environment, and flow charts. The program is written in GPSS IV and was demonstrated at TSC using the GPSS V compiler in the MITRE Corporation's IBM 360/165.

The program has a central logic that couples the three main delay factors of any Terminal Control Area; namely, weather, aircraft schedule, and facility status. This central logic is supported by input variable data matrices which carry the characteristics of a particular TCA. This arrangement makes it possible for the model to be easily changed or enlarged and made to reflect any TCA. It also enables the program to be used to evaluate a wide range of decision options, such as:

Changing facility characteristics

Adding facilities

Airport *design alternatives, e.g., runway location and direction.*

4.1 OPERATING ENVIRONMENT

Any computer with GPSS 360 or GPSS V capability can be used to exercise the model. Approximately 280K bytes of core are required. This is variable and depends upon the number of transactions generated by a particular run. The only peripherals required are a card reader and printer. Since the card deck is in excess of 3000 cards, a high speed reader is a distinct advantage. The program can be stored on tape, but any changes must be made in the basic card deck.

4.2 PROGRAM SPECIFICATION

The program is written in standard GPSS IV and is completely self-contained and self-descriptive.

4.3 SUBPROGRAM

There are no subprograms.

4.4 FLOW CHARTS

Flow charts, shown in Figures 4-1 through 4-6 depict the logic at a medium level of depth. Each block or logic transaction is keyed by numerals to the program statements which are pertinent. The program listing serves, therefore, as the ultimate logic statement. If the flow charts are read in conjunction with the listing by an experienced GPSS programmer, there will be no difficulty interpreting the program.

4.5 SOURCE LISTING

The program listing is provided in Appendix A. The listing has annotated descriptions of all variables and functions. The logic section contains comments adjacent to each GPSS instruction. The data and output matrices are annotated with explanations of rows, columns, and data elements. With this information it is an easy task to change data inputs.

The listing, plus the flow charts and the model description provided in Chapter Three can be used jointly to understand the model. It should be noted, however, that any extensive changes contemplated for the model will require study and analysis by an experienced GPSS-oriented analyst.

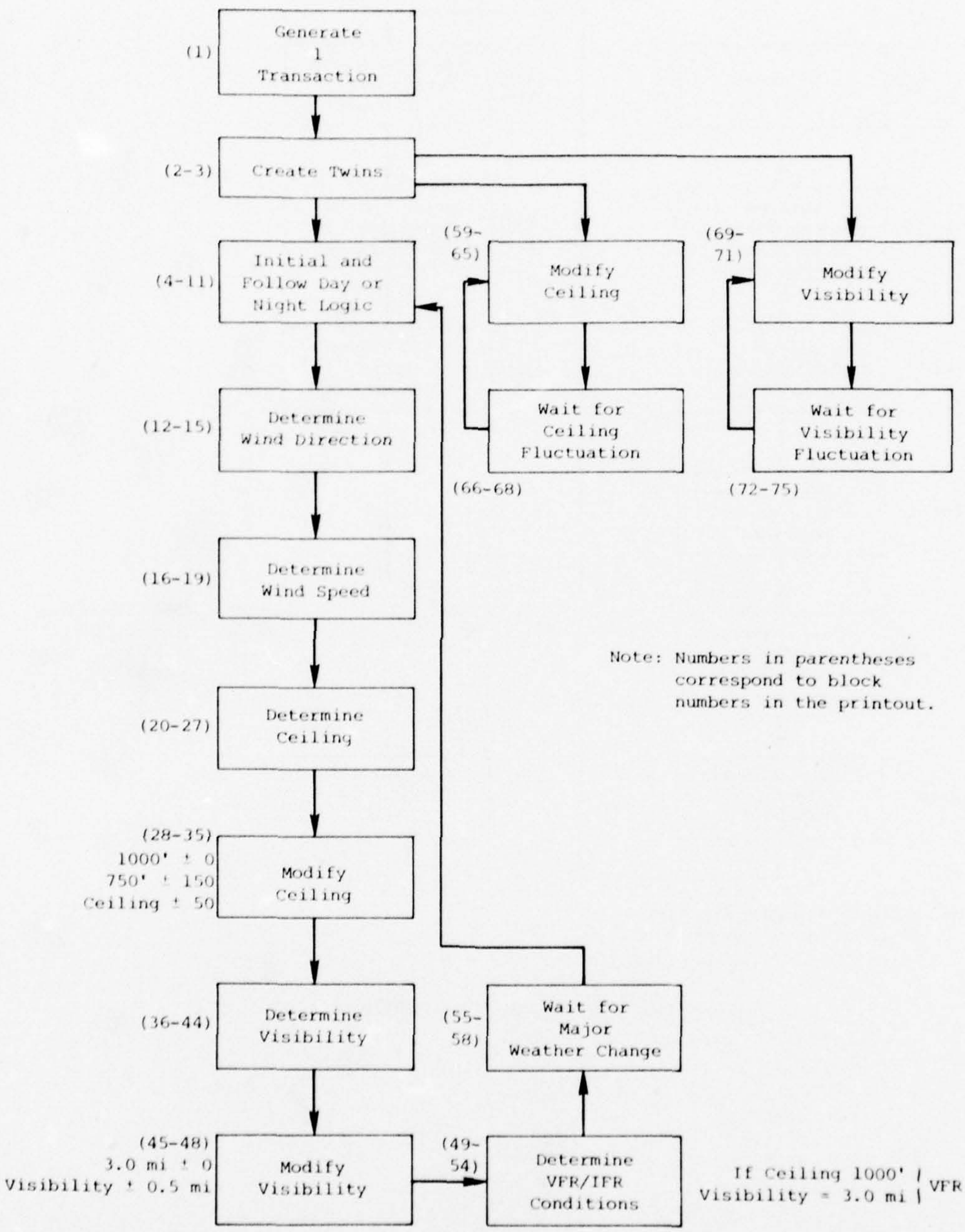
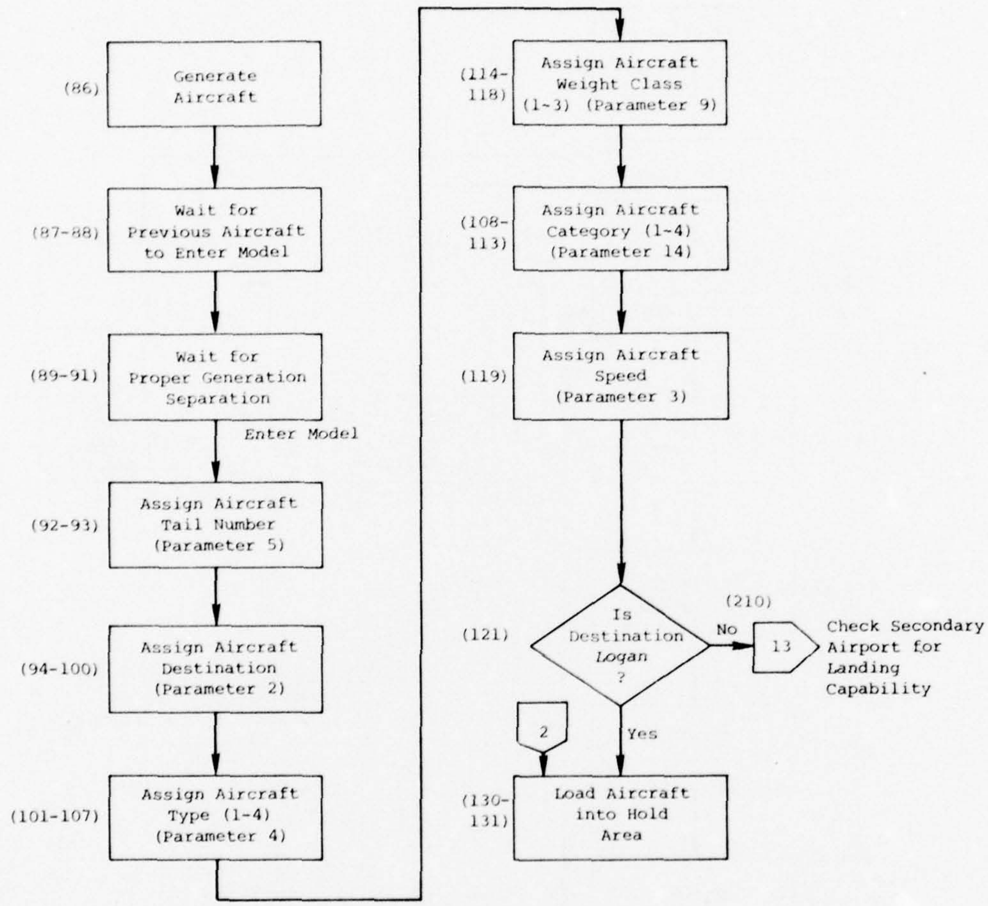
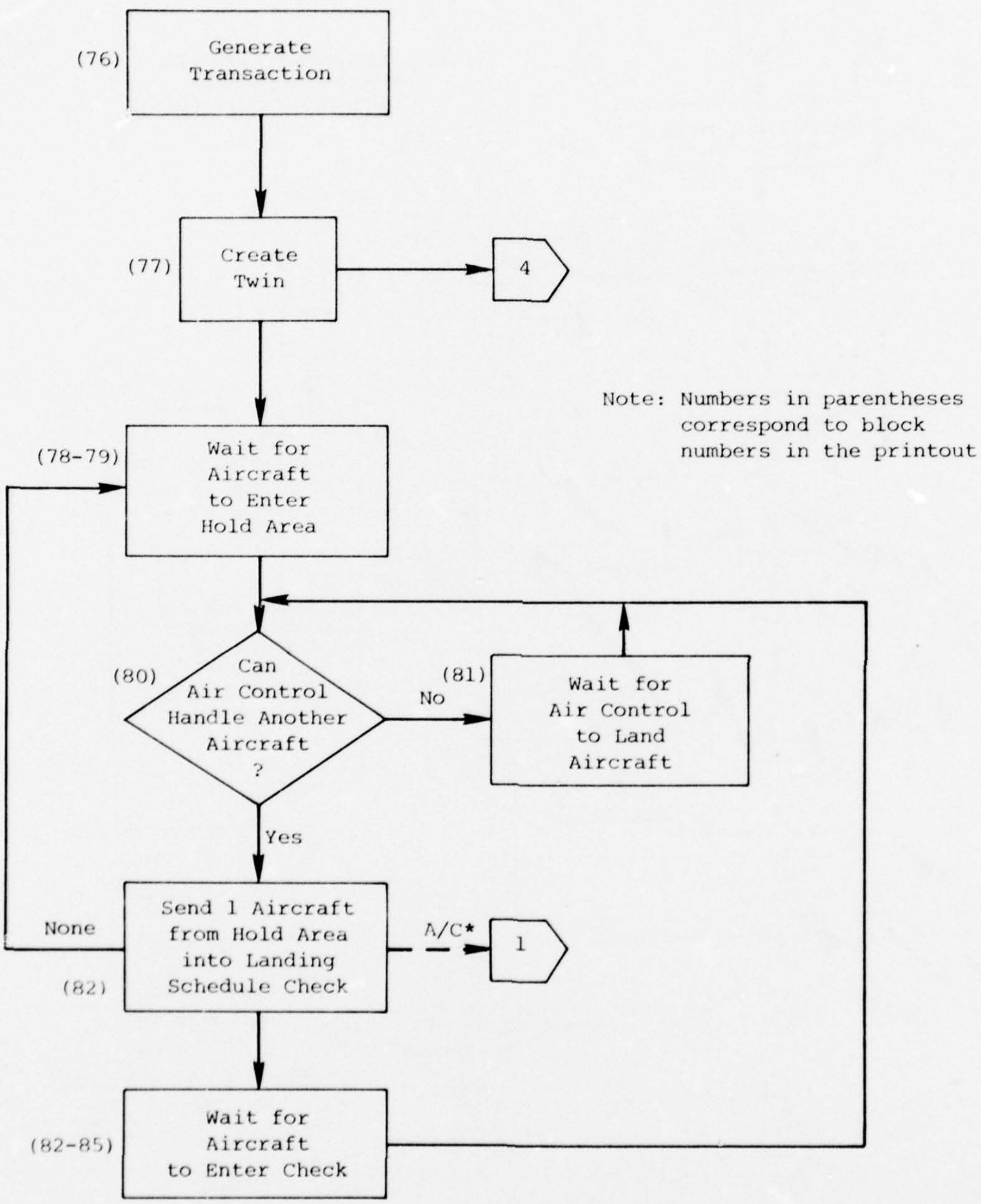


Figure 4-1. **WEATHER MODULE**



Note: Numbers in parentheses correspond to block numbers in printout.

Figure 4-2. AIRCRAFT GENERATION MODULE



*Dotted lines represent flow of aircraft transactions. Solid lines represent flow of logic transactions.

Figure 4-3. AIRCRAFT ACCEPTANCE FUNCTION

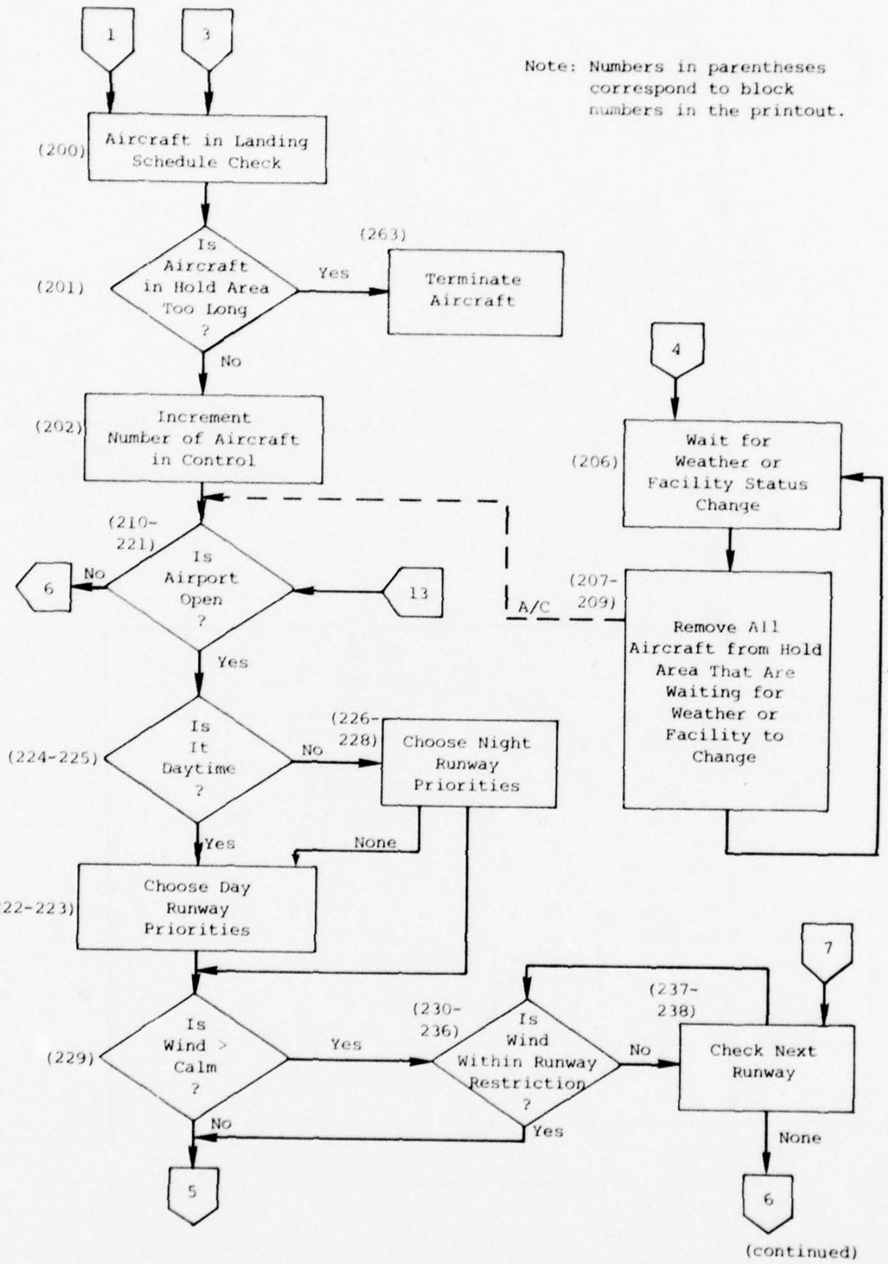


Figure 4-4. MAIN CONTROL LOGIC

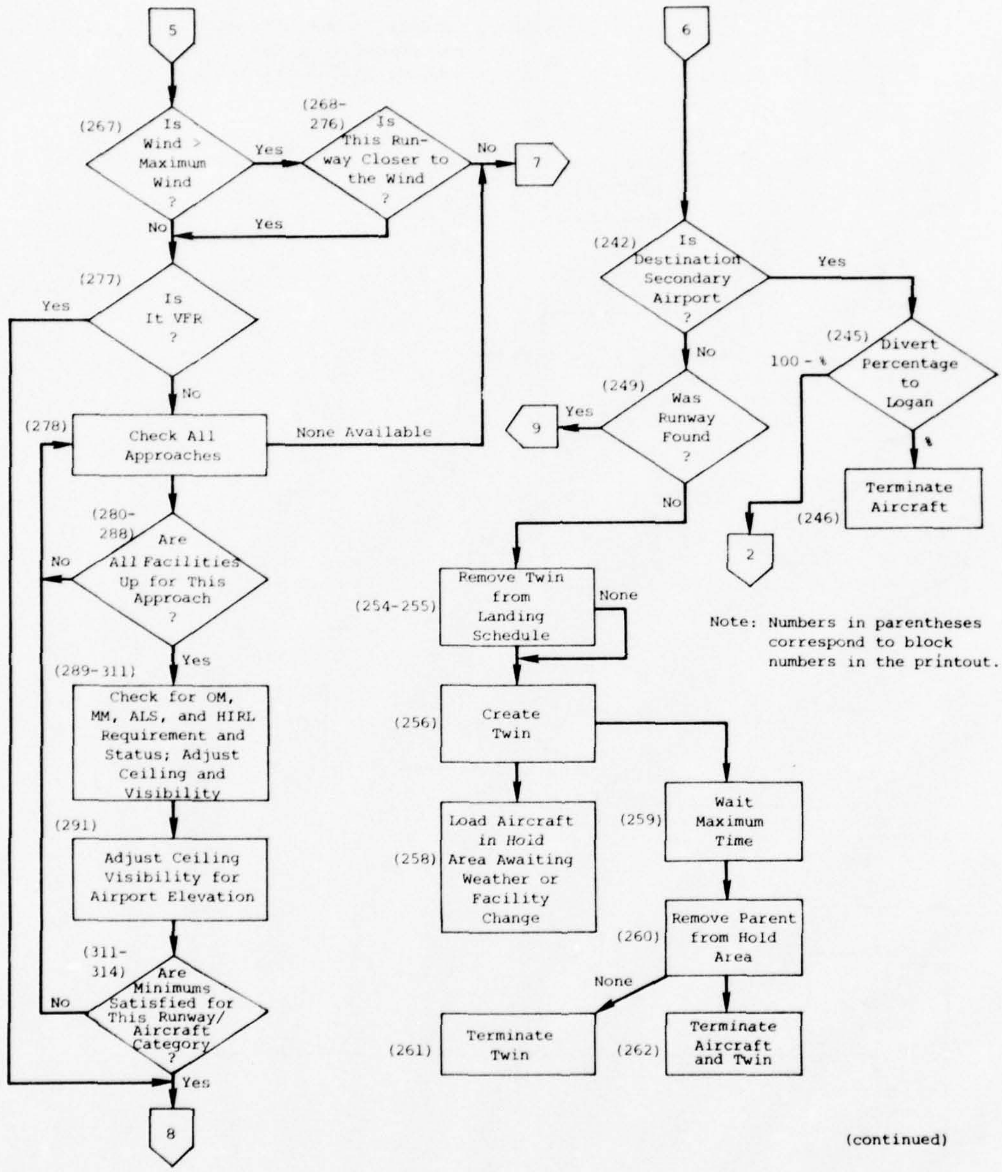


Figure 4-4. (continued)

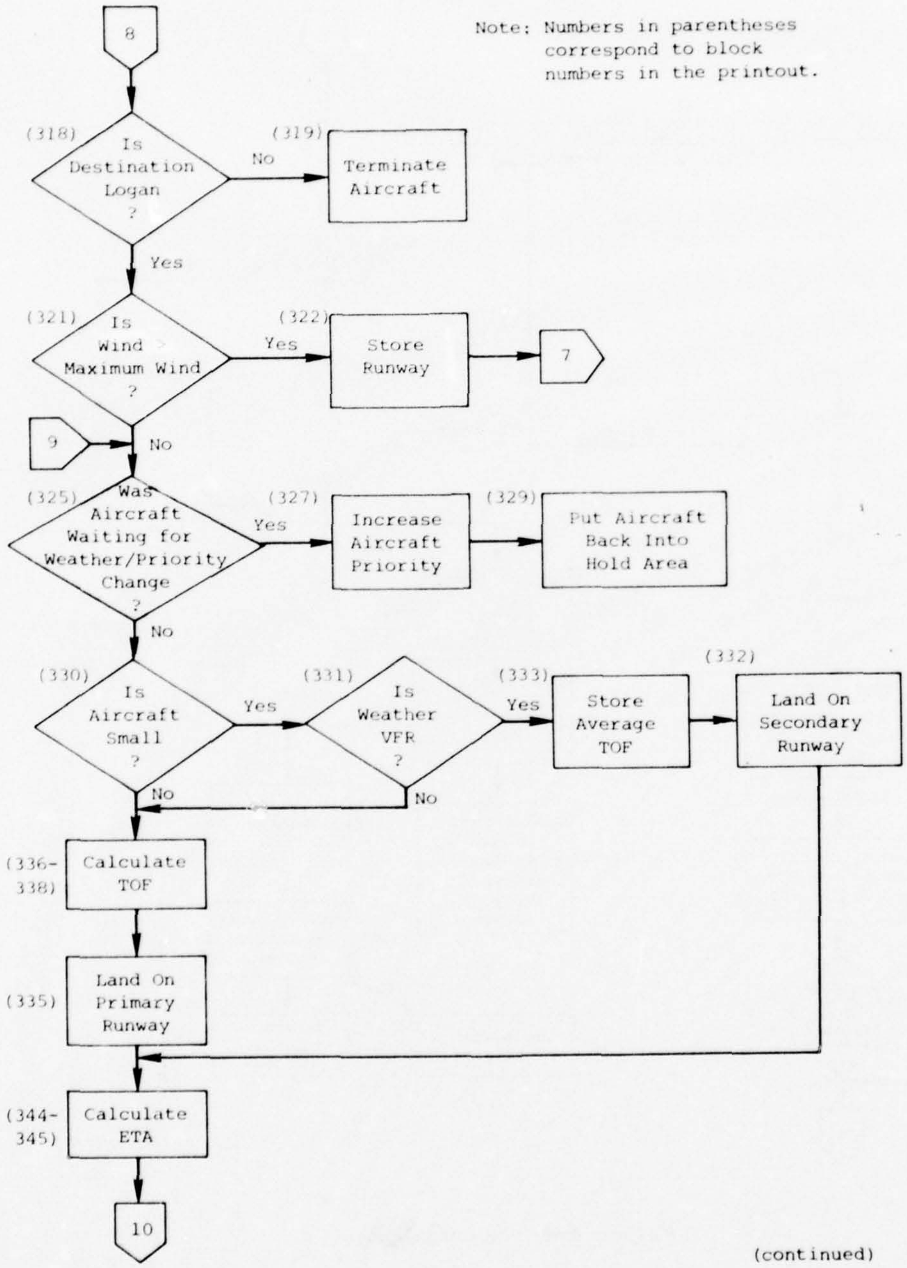


Figure 4-4. (continued)

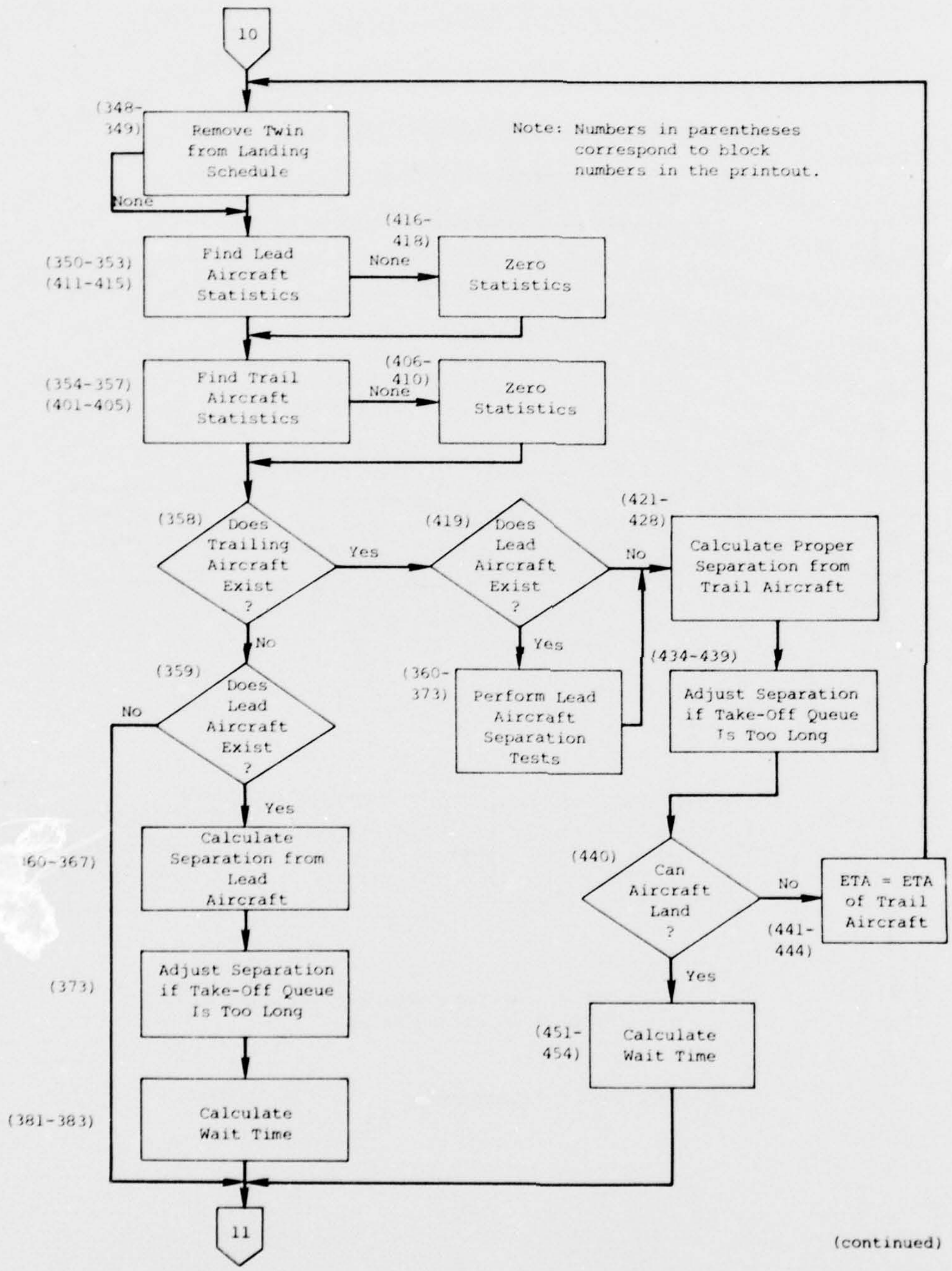
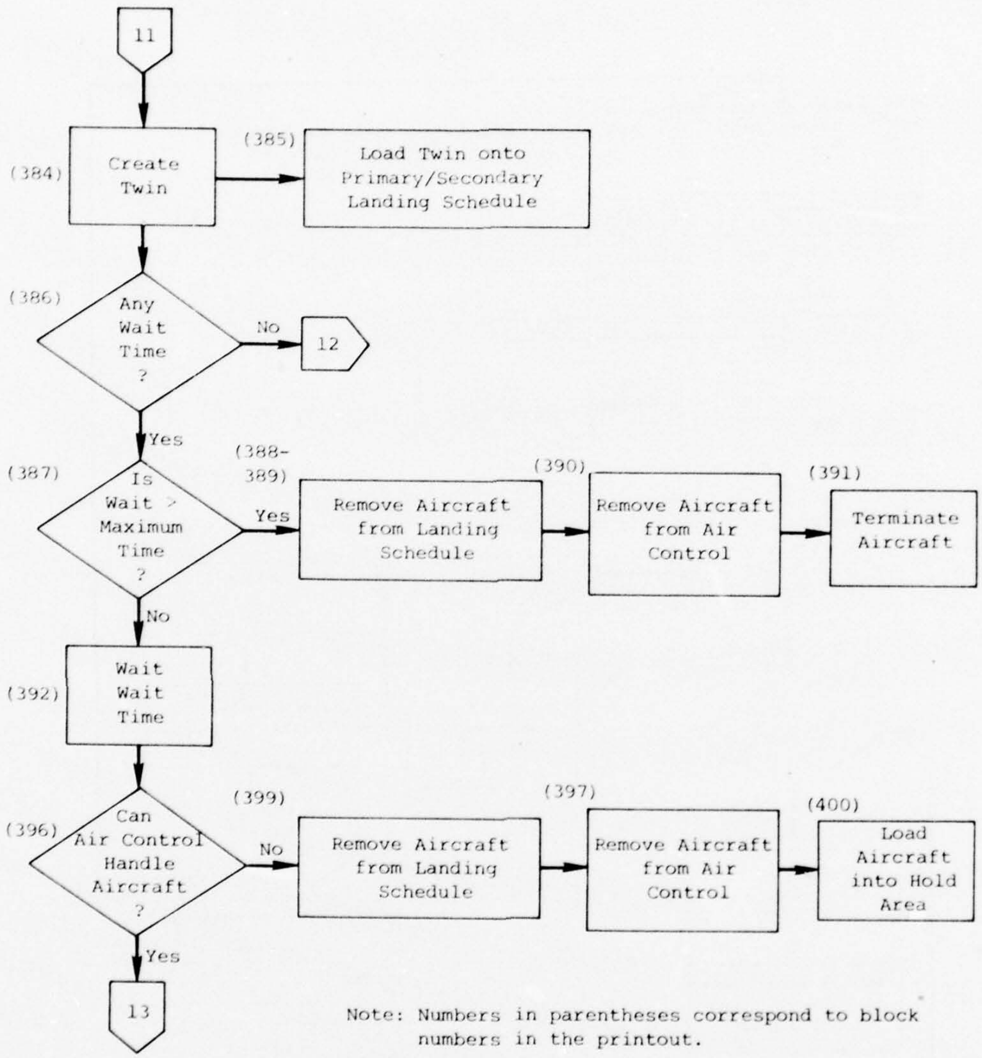


Figure 4-4. (continued)



Note: Numbers in parentheses correspond to block numbers in the printout.

Figure 4-4. (continued)

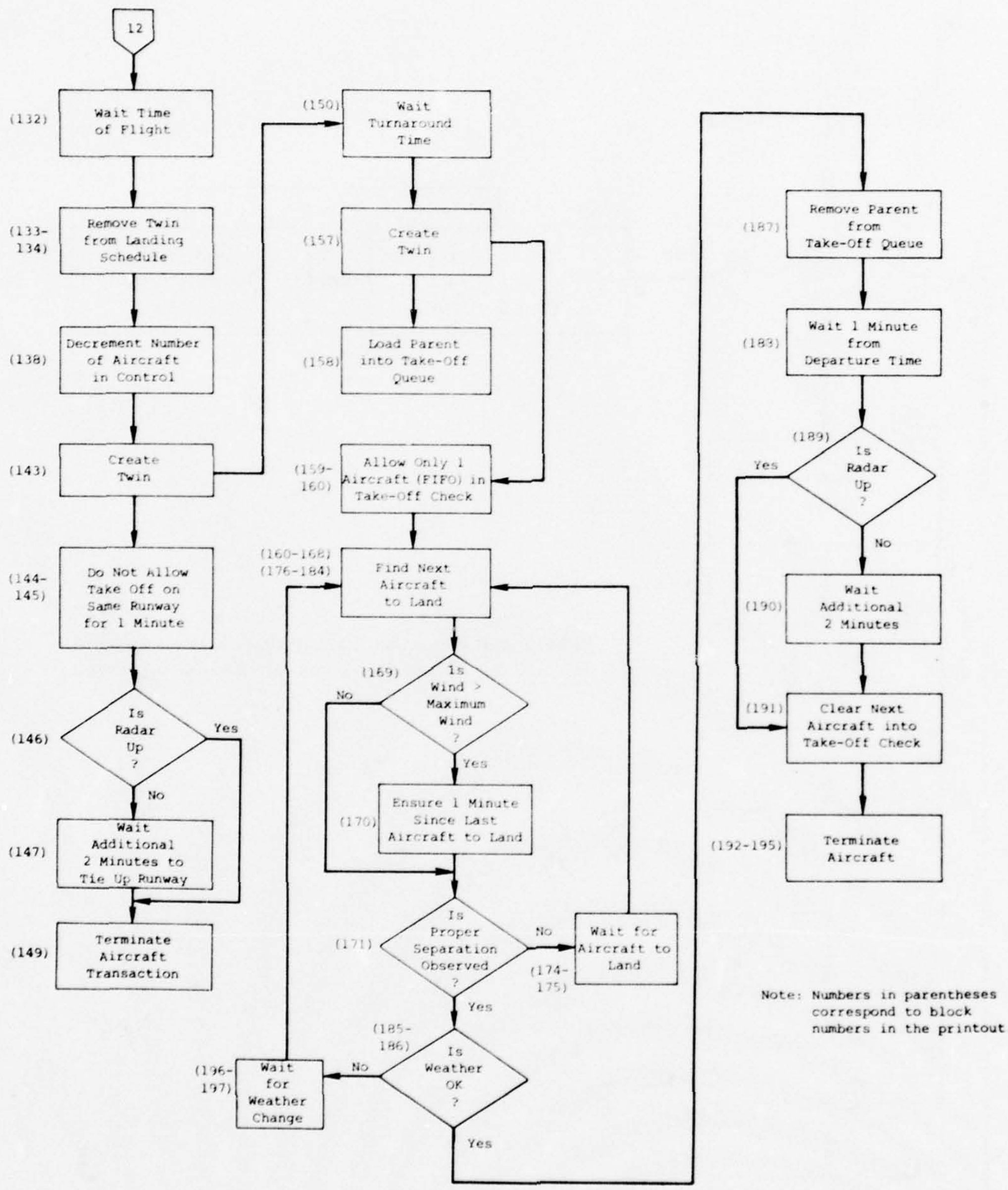


Figure 4-5. LANDING TO TAKE OFF AT LOGAN

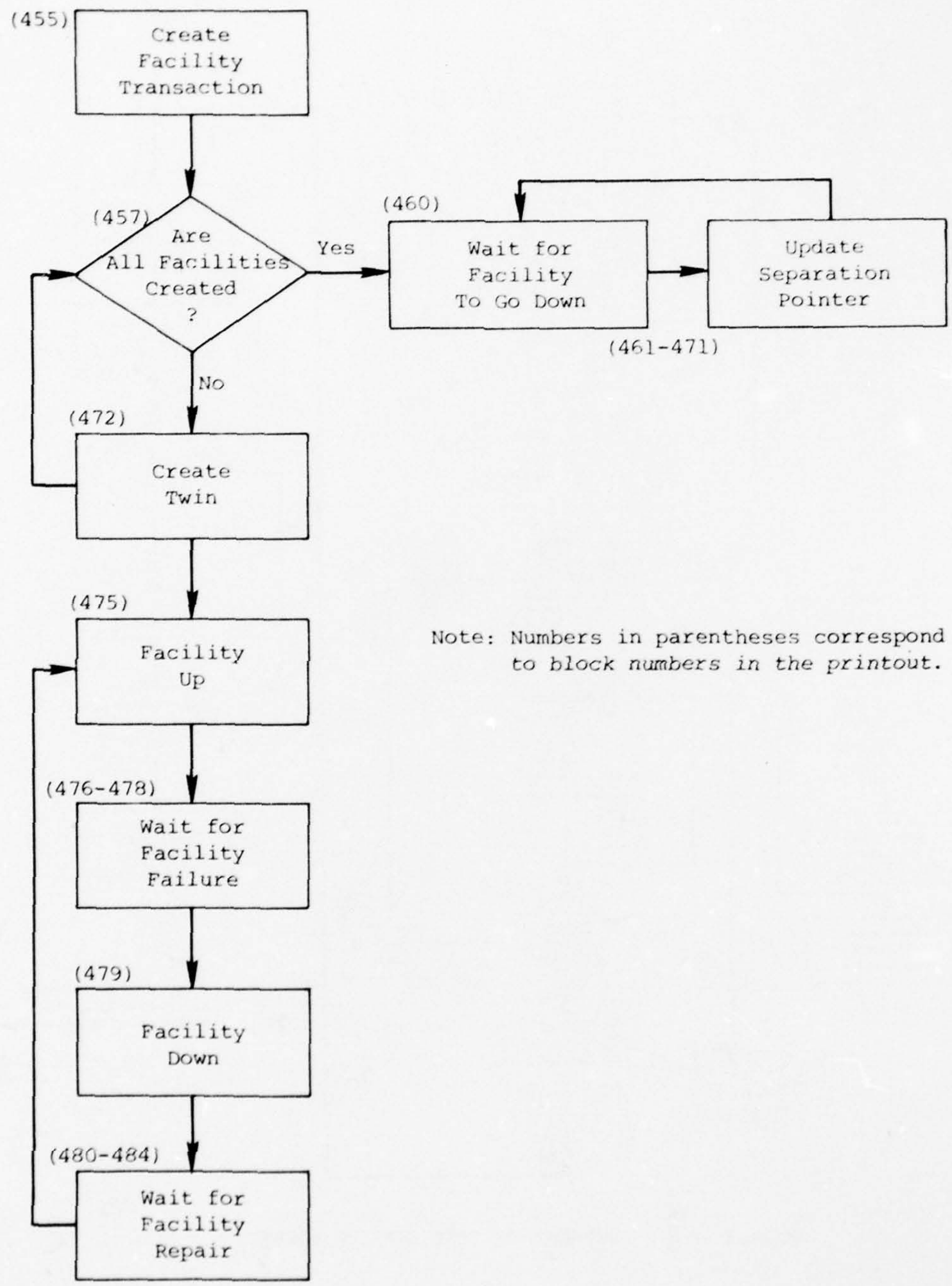


Figure 4-6. FACILITY STATUS MODULE

CHAPTER FIVE

PROGRAM USE

The deck set up for any GPSS program consists of the GPSS card deck with the Job Control Language (JCL) cards. The JCL will vary from machine to machine. Instructions concerning how to use the JCL deck will depend, therefore, on the machine in use.

Unlike most computer languages, GPSS does not use conventional input data cards at the end of the program. Input data in GPSS is organic to the model in the form of matrices and savevalues which are initialized at the beginning of the source program (GPSS does not have an object program). Descriptions of these inputs are provided in Section 5.1. The model can produce outputs tailored to the user's need. Outputs are presented in Section 5.2.

5.1 *REQUIRED UDCM INPUT DATA*

This section describes the nature of the data required by the UDCM. The numerical quantities presented herein are those used in the model as it was configured for demonstration. Examples of input matrices are included in their respective subsections. A complete listing of the input data matrices is included in the program printout in Appendix A.

5.1.1 Weather Data

Figure 5-1 provides a sample of how weather data was received from the National Climatic Survey. This figure shows weather conditions during daylight hours with the wind from the North. The study used 32 such tables, corresponding to all 16 points of the compass for day and night.

Table 5-1 is derived from Figure 5-1. The derivation was performed manually and displays ceiling frequencies as a function of wind direction and velocity. For example, summing over the columns of Figure 5-1 for a wind speed of 10-14 knots, wind column under ceiling category 1000^+, gives a frequency of 103 observations. This figure is displayed in the first row, third column of Table 5-1. The same procedure is repeated for all entries in Table 5-1.

STA	DIR	CEILING GROUPS IN FEET	VEL GROUPS M.P.H.	VISIBILITY GROUPS IN MILES 0-1/4	5/16-1/2	5/8-7/8	1	1 1/4-1 1/2	1 3/4-2 1/2	3+	TOT OBS
14739	N	1000+	1-4					1		21	22
			5-9				1			131	132
			10-14				1	1	1	100	103
			15-29							57	57
			30+								
			TOT				2	2	1	309	314
		600-900	1-4							2	2
			5-9		1		1	1	2	6	11
			10-14		1	1			1	15	18
			15-29		1		2	2	1	10	16
			30+							3	3
			TOT		3	1	3	3	4	36	50
		500	1-4							1	1
			5-9				1		1	3	5
			10-14							3	3
			15-29		1	1		2	1	3	8
			30+								
			TOT		1	1	1	2	2	10	17
		400	1-4					1			1
			5-9						1	1	2
			10-14	1	1				2	3	7
			15-29							3	3
			30+							1	1
			TOT	1	1			1	3	8	14
		300	1-4							1	1
			5-9				3			1	4
			10-14					2		3	5
			15-29			1		1		2	4
			30+								
			TOT			1	3	3		7	14
		200	1-4		1				1		2
			5-9								
			10-14					1			1
			15-29								
			30+								
			TOT		1			1	1		3
14739	N	0-100	1-4	1							1
			5-9		1	1	1				3
			10-14								
			15-29	1							1
			30+								
			TOT	2	1	1	1				5
		TOT VIS		3	7	4	10	12	11	370	417
		VEL GRPS			1-4	5-9	10-14	15-29	30+	CALM	
		TOT VEL			30	157	137	89	4		417
		% VEL			7.2	37.6	32.9	21.3	1.0		100.0
		% DIR									5.7

Figure 5-1. SAMPLE OF NATIONAL CLIMATIC SURVEY WEATHER DATA

Table 5-1. FREQUENCY OF OCCURRENCE OF CEILING, GIVEN WIND DIRECTION (NORTH), SPEED, AND DAYLIGHT HOURS					
Ceiling (Feet)	Velocity (Knots)				
	1-4	5-9	10-14	15-29	30+
1000+	22	132	103	57	0
600-900	2	11	18	16	3
500	1	5	3	8	0
400	1	2	7	3	1
300	1	4	5	4	0
200	2	0	1	0	0
0-100	1	3	0	1	0
Total	30	157	137	89	4

Table 5-2. FREQUENCY OF OCCURRENCE OF VISIBILITY, GIVEN CEILING, WIND DIRECTION (NORTH), AND DAYLIGHT HOURS							
Visibility (Nautical Miles)	Ceiling (Feet)						
	1000+	600-900	500	400	300	200	0-100
0 to 1/4	0	0	0	1	0	0	2
5/16 to 1/2	0	3	1	1	0	1	1
5/8 to 7/8	0	1	1	0	1	0	1
1	2	3	1	0	3	0	1
1-1/4 to 1-1/2	2	3	2	1	3	1	0
1-3/4 to 2-1/2	1	4	2	3	0	1	0
3	309	36	10	8	7	0	0
Total	314	50	17	14	14	3	5

Table 5-2 is derived from Table 5-1. Given the ceiling of, for example, 1000+, a total of 314 observations occur, as can be seen by summing over the first row of Table 5-1. Of these, 309 occured when the visibility was 3^+, 1 when the ceiling was 1-3/4 - 2-1/2 nautical mile, and so on. These data were converted to cumulative percentages, expressed as numbers 000 to 999, for computer utilization.* Figure 5-2 shows an example of such a table, expressed as a matrix, as printed out in a program run.

The top matrix in this figure is first used to find the wind direction, or whether it is calm. Column 1 displays 17 entries, row 1 representing a calm condition, and each of the others display one of the 16 points of the compass. Columns 2 and 3 contain cumulative percentages of occurrences for each of these conditions -- column 3 for daylight hours, column 2 for night. A uniform random variable, U, is drawn from the unit interval and compared with the numbers in column 2 or 3. For example, assume daylight hours, and let the number drawn be .045, or equivalently 045 and, thus, since $045 \leqslant 058$ (row 2, column 3), the wind is from the north. To determine wind speed, another U is drawn and compared with the odd-numbered column elements in row 2. If U = 720, and $448 < 720 \leqslant 777$ (where 448 is in row 2, column 7 and 777 is in row 2, column 9) the wind speed is 12 knots.

To determine ceiling, columns 12 and 13 identify the ceiling and visibility matrices for each wind direction and matrix 4 (the middle table of the figure) is used for ceiling determination with a north wind. Column 6 corresponding to a speed of 12 knots, daylight, is entered with another value of U, for example 921. Since $905 < 921 \leqslant 956$, the ceiling is 400 feet.

When the ceiling is determined, matrix 5 (the last table in the figure) is used to find the visibility. A new U is obtained and compared with the entries in column 8, which corresponds to a 400-foot ceiling, north wind, daylight hours. If U = 415, and $214 < 415 \leqslant 429$, the visibility is 2 miles.

There is no row in the wind direction, ceiling, and visibility matrices corresponding to 30 knots, 50 feet, and 3 miles, respectively. These are defaults which, if U is greater than any number in the column, the value associated with these quantities is assigned. The tabulated values of wind direction and speed, ceiling and visibility are thus found and treated by

---

*Using a portable calculator, the cumulative distributions shown in the weather matrices were derived from the National Climatic Service (NCS) data. For future applications of the model to TCAs other than Boston, it is recommended that the weather data base be acquired from NCS on magnetic tape and the conversion be made by computer. A simple FORTRAN program could be written to convert the data to the desired format and punch a card deck for GPSS input.

MATRIX HALFWORD SAVEVALUECIRVL

Wind Direction in Degrees

		NT	DY	NT	DY	NT	DY	NT	DY	NT	DY	Ceiling Matrix	Visibility Matrix
	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13
Calm 1	360	7	1	1000	1000	1000	1000	1000	1000	1000	1000	2	3
N 2	0	96	58	61	7	576	448	839	777	1000	990	4	5
NNE 3	22	128	85	152	76	704	510	891	753	996	995	6	7
NE 4	45	163	118	113	29	510	324	755	639	981	979	8	9
ENE 5	67	198	169	82	441	494	0	724	770	981	992	10	11
E 6	90	232	263	167	49	642	437	776	820	976	996	12	13
ESE 7	112	254	348	207	47	671	0	866	804	994	1000	14	15
SE 8	135	272	398	237	66	777	680	935	962	993	995	16	17
SSE 9	157	296	425	153	101	736	641	939	924	1000	995	18	19
S 10	180	365	489	109	53	757	456	949	803	1000	985	20	21
SSW 11	202	424	550	58	20	569	211	845	602	1000	998	22	23
SW 12	225	496	591	48	17	479	195	779	510	998	1000	24	25
WSW 13	247	616	663	19	15	439	302	827	645	999	992	26	27
W 14	270	776	777	69	14	312	211	651	498	990	966	28	29
WNW 15	292	836	874	33	101	295	184	649	439	974	977	30	31
NW 16	315	937	958	26	20	396	225	734	554	996	993	32	33
NNW 17	337	1000	1000	30	13	413	835	835	658	1000	1000	34	35
18	0	0	0	0	0	0	0	0	0	0	0	0	0
	Wind direction in degrees	Number of cumulative occurrences, out of 1000, of wind direction in Day/Night		3 Knots		7 Knots		12 Knots		22 Knots		Default = 30 Knots	

Wind Velocity

MATRIX HALFWORD SAVEVALUE 4

	NT	DY	NT	DY	NT	DY	NT	DY	NT	DY
Ceiling COL.	1	2	3	4	5	6	7	8	9	10
1000' 1	825	733	798	841	762	752	714	640	1000	0
750' 2	850	800	857	911	878	883	876	820	1000	750
500' 3	850	833	881	943	901	905	933	910	1000	750
400' 4	850	866	914	956	948	956	962	944	1000	1000
300' 5	875	900	950	981	977	992	991	989	1000	1000
200' 6	950	967	977	981	994	1000	1000	989	1000	1000
Default = 50'										
Wind Velocity	3 Knots		7 Knots		12 Knots		22 Knots		30 Knots	

Ceiling matrix for wind N

MATRIX HALFWORD SAVEVALUE 5

	NT	DY	NT	DY	NT	DY	NT	DY	NT	DY	NT	DY	NT	DY
Visibility in Miles COL.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
.25 1	0	0	0	0	0	0	0	71	0	0	63	0	455	400
.50 2	2	0	0	60	0	59	0	143	0	0	313	333	728	600
.80 3	2	0	17	80	56	118	91	143	48	71	501	333	819	800
1.00 4	6	6	51	120	111	176	136	143	238	286	564	333	910	1000
1.50 5	6	13	85	200	222	294	227	214	381	500	814	667	910	1000
2.00 6	12	16	171	260	389	412	485	429	810	500	877	1000	1000	1000
Default = 3.00														
Ceiling	1000'		750'		500'		400'		300'		200'		50'	

Visibility matrix for wind N

Figure 5-2. SAMPLE OF WEATHER MATRIX INPUTS

the computer as nominal values to which, within their respective ranges of values, a random uniform increment is added or subtracted. As mentioned in Section 3.2 of Chapter Three, between wind changes, ceiling and visibility are allowed to fluctuate randomly within their ranges by an exponential process with a mean time of change of 15 minutes.

5.1.2 Arrival Rates

Chapter Three discussed how overall arrival rates can be calculated. The arrival rate data were not collected in the form discussed; that is, arrival rates for both weather conditions at all destination airports by time of day were not known. Were these available, the overall arrival rate for any hour, both VFR and IFR, could be found by summing λ_{ijk} over i — the destination airports. An approximation was used in the model demonstration. The source for this approximation was data from the Performance Measurement System (PMS) for Airports, dated November 1975. Figure 5-3 was taken from this report and shows arrivals of scheduled aircraft as a function of time. This graph was converted, by manual measurement, into a table of approximate numbers. The table was extended quite arbitrarily to cover a 24-hour day. It was assumed that these rates could be made applicable to IFR or VFR conditions by multiplying them by a constant. This, in fact, was done in the demonstration runs. In other words, at present, these data are not authoritative. The last column in Figure 5-4 shows the rate of arrival, by time of day, for VFR conditions. These figures are the same as those used in the demonstration at TSC on September 20-22, 1976. Other uses of the matrix in Figure 5-4 are discussed in the following section. It is suggested that before the model is exercised for analysis that these data be collected in the form called for in the previous discussions. Assuming the total arrival rates for weather conditions and time of day for each destination airport were available, the model could be expected to simulate accurately the phenomenon of arrival time creation.

5.1.3 Destination Assignment

Although it was desired to have the percentage of aircraft, by type, time of day, and weather condition, landing at each airport, this information was not available.

Table 3-1 of Chapter Three gives some of the requisite data for instrument approaches. No corresponding data was available for VFR approaches. Thus, while it can be surmised that, for example, the relative number of general aviation aircraft would materially increase under VFR conditions, more so relatively than air carriers, the factor is unknown. For lack of better information, the data in Table 3-1 was used for both weather conditions.

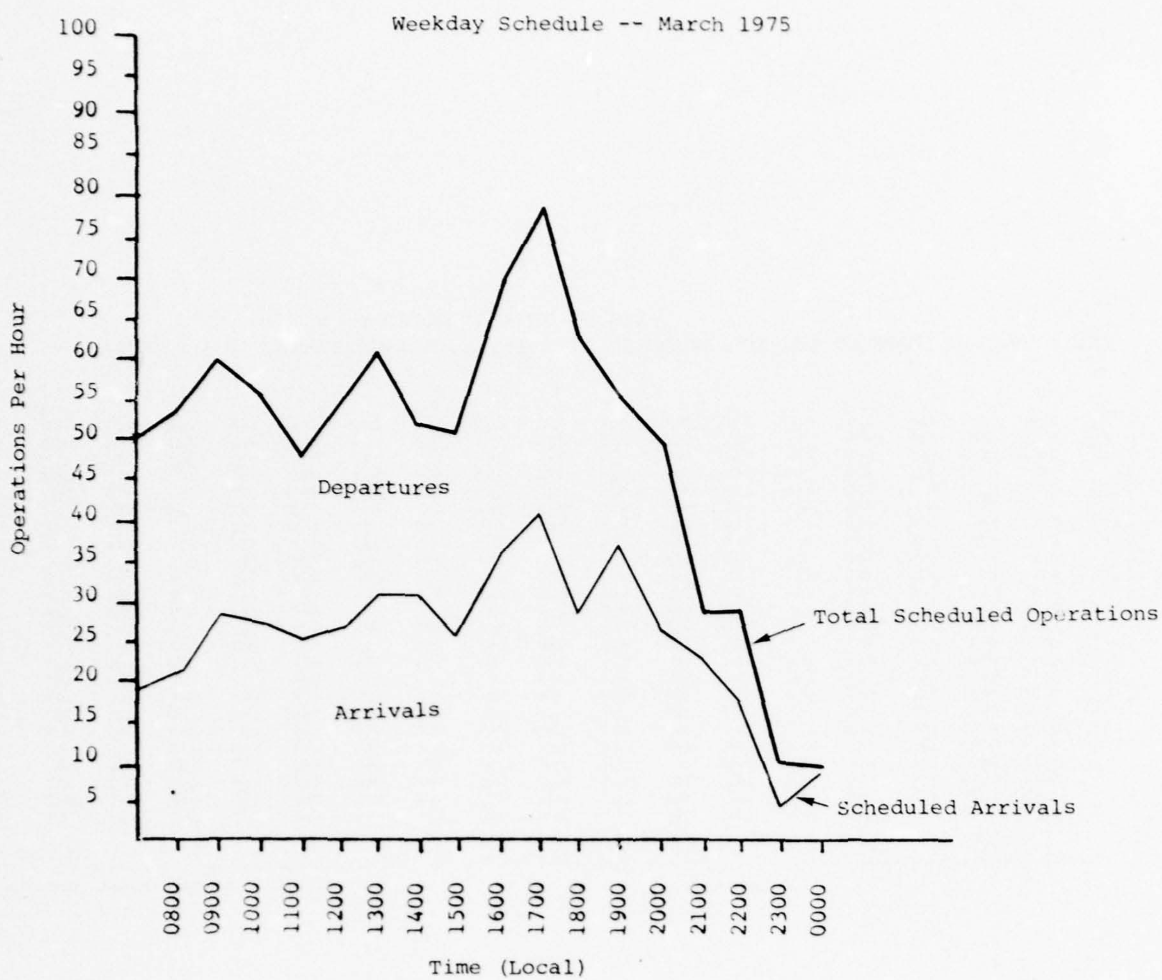


Figure 5-3. SCHEDULED ARRIVAL RATE AT LOGAN

MATRIX HALFWORD SAVEVALUEVFRAC

		Hold Areas				Secondary Airports												Default to Tew Mac
	COL.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ROW	1	297	597	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	7
	2	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	6
	3	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	5
	4	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	8
	5	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	11
	6	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	17
	7	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	25
	8	260	522	740	784	871	871	871	954	955	955	955	955	955	998	998	1000	1000	30
	9	251	502	711	752	836	929	946	947	948	954	954	955	955	996	997	998	999	41
	10	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	40
	11	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	39
Time of Day	12	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	40
	13	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	46
	14	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	46
	15	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	40
	16	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	53
	17	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	60
	18	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	43
	19	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	53
	20	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	46
	21	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	33
	22	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	26
	23	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	7
	24	269	538	763	807	897	997	997	997	998	998	998	998	998	998	998	1000	1000	12

Number of aircraft created in VFR conditions

Figure 5-4. DISTRIBUTION OF AIRCRAFT DESTINATIONS AND OVERALL ARRIVAL RATES AS A FUNCTION OF TIME OF DAY

These data are incorporated in Figure 5-4 in the following way. Of the 31283 aircraft arriving in the Boston TCA, 26142 or 83.6 percent, are destined for Logan. It is assumed that this condition prevails when all airports are open. When some of the secondary airports are closed, the percentage will be higher. The first five columns of Figure 5-4 correspond to holding fixes serving Logan. Between the hours of 0800 and 1800 all airports are open, and in column five the figure 836, corresponding to 83.6 percent, tells the model to assign that percentage of all aircraft to Logan. These aircraft are assigned to each holding fix on the basis of information supplied by Logan approach control personnel. For those aircraft destined for Logan, the percentages assigned to the five holding fixes are as presented in Table 5-3.

Table 5-3. PERCENTAGE OF AIRCRAFT BOUND FOR LOGAN ENTERING OVER HOLDING FIXES

Fix	Fix Number	Percentage
Manjo	1	30
Millis	2	30
Bridgewater	3	25
Skipper	4	5
Lawrence	5	10

The figures are then reflected in the cumulative percentages in the first five columns of Figure 5-4. For example, Manjo, holding fix number 1 in Figure 5-4, gets 30 percent of Logan traffic, thus $.3 \times .836 = .251$, and this number 251 is seen in the first column between the hours of 0800 and 1800. For times of day when some of the secondary airports are closed, the traffic totals were distributed over the airports which were open.

To find a destination, a uniform random number is drawn and is compared for the time of day with the cumulative distributions shown in Figure 5-4. For example, at 0915 the number 943 is drawn. Entering row 10 it can be seen that $928 < 943 \leq 946$, hence the destination is airport number 7 — Beverly.

Columns 1 through 5 correspond, respectively, to Manjo, Millis, Bridgewater, Skipper, and Lawrence. Columns 6 through 17 correspond to Bedford, Beverly, Fitchburg, Fort Devens, Lawrence, Mansfield, Marshfield, Newburyport (Plum Island), Norwood, Plymouth, South Weymouth, and Taunton, respectively. The last column, treated by the program as a default, is Tew-Mac, and shows the hourly rate of total arrivals.

5.1.4 Assignment of User Types

Having the destination, the user type can be assigned on the basis of the data in Table 3-1 of Chapter Three. Figure 5-5 shows the selection matrix. Its relationship to Table 3-1 can be seen in the following example.

Suppose the destination is Bedford, where 2902 is the total. Of these, 87 or 2.99 percent are air carriers, 235 or 8.09 percent are air taxis, 2425 or 83.56 percent are general aviation, and 155 or 5.34 percent are military. If these percentages are changed to numbers between 0 and 1000, the cumulative distribution is 30, 111, 947, and 1000. Row 6 of Figure 5-5 shows, for columns 1, 2, and 3, corresponding to air carrier, air taxi, and general aviation, respectively, the first three of these numbers. Military aircraft are treated as defaults.

MATRIX HALFWORD SAVEVALUEVFRPT

ROW (A/C Destinations)	COL. 1	2	3
1	782	897	996
2	782	897	996
3	782	897	996
4	782	897	996
5	782	897	996
6	30	111	947
7	0	2	816
8	0	0	1000
9	0	0	38
10	0	190	1000
11	0	0	1000
12	0	0	1000
13	0	0	1000
14	2	11	869
15	0	0	1000
16	0	0	174
17	0	0	1000
18	0	235	1000

A/C Type (Default = type 4)

Matrix is used to determine aircraft type once destination is known in VFR conditions.

Figure 5-5. USER TYPE BY DESTINATION

Since no VFR data, corresponding to Table 3-1 exists, the matrix corresponding to IFR conditions is identical to Figure 5-4.

5.1.5 Distribution of Weight Class as a Function of Type

Table 5-4 presents aircraft distribution data derived from information supplied by TSC, and based in part on FAA equipment forecast for air carrier operations at Logan. The weight classes were assigned to the forecast aircraft types in accordance with Appendix 3 to Reference 5. The figures are approximations; therefore, before the model is used for analysis, they should be verified.

Table 5-4. FREQUENCY DISTRIBUTION OF AIRCRAFT WEIGHT CLASSES			
Type	Weight Class		
	Small	Large	Heavy
Air Carrier	0	.9	.1
Air Taxi	.1	.9	0
General Aviation	.9	.1	0
Military	.02	.9	.08

5.1.6 Distribution of Approach Category as a Function of Type

Table 5-5 presents approach category data which was also based on information supplied by TSC. The figures are approximations; therefore, before the model is used for analysis, they should be verified.

Table 5-5. FREQUENCY DISTRIBUTION OF AIRCRAFT APPROACH CATEGORIES				
Type	Approach Category			
	A	B	C	D
Air Carrier	0	.05	.1	.85
Air Taxi	.9	.1	0	0
General Aviation	.9	.07	.03	0
Military	.1	.3	.3	.3

Table 5-4 is combined with Table 5-5 as a single input matrix, and is displayed in Figure 5-6. The data are shown as cumulative probability distributions.

5.1.7 Route Distances from Holding Fixes to Logan under Radar and Nonradar (VORTAC) Environments

The distance tables are shown in Figures 5-7 and 5-8 as program input matrices. The numbers in row 6 (Figure 5-8) define the matrices that carry airport data.

MATRIX HALFWORD SAVEVALUECATWT

		COL. 1	2	3	4	5	6	7	
ROW	1	0	0	787	1000	0	787	1000	Air Carrier
	2	0	1000	1000	1000	0	1000	1000	Air Taxi
A/C	3	1000	1000	1000	1000	1000	1000	1000	General Aviation
Type	4	300	500	1000	1000	500	1000	1000	Military
		Approach Category				Weight Class			

Matrix is used to define aircraft category and weight, once type has been determined.

Figure 5-6. CUMULATIVE FREQUENCY DISTRIBUTION OF AIRCRAFT APPROACH CATEGORIES AND WEIGHT CLASSES

5.1.8 Distances from Secondary Airports to Logan

The distances from the secondary airports to Logan are also shown in Figures 5-7 and 5-8.

5.1.9 Minima for Each Approach Serving Each Runway by Approach Category

Ceiling-visibility and landing approach data are tabulated for each runway at each airport. Table 5-6 shows these minima for Logan, and Figure 5-9 shows the same data displayed as they are presented to the computer except that the order of the runways is different. In Table 5-6, different minima are shown for the same type of approach on different runways. This is because the minima depend on whether a straight-in or circling approach is used.

5.1.10 Identity of All Facilities Necessary for Each Approach at Each Runway

Table 5-7 was compiled by examination of the Instrument Approach Procedure Charts, and defines those facilities which are necessary for a particular approach. The numbers are either zero or non-zero. A zero indicates that the facility is not necessary. A non-zero entry is the number of the facility as carried in the Facility Status File.

Figure 5-10 displays the same data in the form of the program input matrix. The first four columns show those facilities essential to the approach. The last four columns are facilities which, if down, have only the effect of raising the minima for the approach, as prescribed by FAA regulations.

MATRIX HALFWORD SAVEVALUEDSTNR

	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ROW 1	26	49	39	55	26	15	14	38	49	27	34	31	27	28	31	28	45	24
2	38	39	39	38	36	38	21	62	55	38	45	31	35	38	42	28	45	35
3	26	38	46	26	43	28	14	49	45	27	55	41	27	48	52	38	55	24
4	19	18	29	25	39	45	35	66	62	51	34	21	48	28	31	17	34	45
5	27	38	29	44	27	15	24	38	48	28	42	55	38	28	58	38	52	17

Same as DSTN matrix

Figure 5-7. DISTANCE TABLE HOLDING FIXES AND SECONDARY AIRPORTS TO PRIMARY AIRPORT - RADAR DOWN

MATRIX HALFWORD SAVEVALUE DSTN

			Hold Areas					Secondary Airport											
		COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Logan Runways	ROW 1	4	34	25	19	31	49	27	36	46	39	46	22	29	55	12	33	14	30	38
	2	27	39	45	41	18	33	16	22	37	31	25	22	29	34	12	33	14	30	38
	3	22	33	45	41	20	26	26	16	38	43	23	47	36	28	43	45	35	49	24
	4	33	50	29	25	20	44	43	35	68	63	43	29	20	40	26	29	30	32	49
	5	15	25	32	47	41	26	16	22	37	31	25	36	51	34	34	55	35	52	17
	6		101	101	101	101	101	106	107	108	109	110	111	112	113	114	115	116	117	118

Airport definition matrix number (Row)

Distance from hold area/secondary airport to Logan in a radar environment

Column Headings

1	Manjo	10	Lawrence
2	Millis	11	Mansfield
3	Bridgewater	12	Marshfield
4	Skipper	13	Newburyport
5	LWM	14	Norwood
6	Bedford	15	Plymouth
7	Beverly	16	S. Weymouth
8	Fitchburg	17	Taunton
9	Ft. Devens	18	Tew-Mac

Figure 5-8. DISTANCE TABLE HOLDING FIXES AND SECONDARY AIRPORTS TO PRIMARY AIRPORT - RADAR UP

Table 5-6. RUNWAY APPROACH MINIMA						
Approach	Runway					Approach Category
	27	22L	33L	4R	15R	
VOR	460 - 1	680 - 1	680 - 01	680 - 01	680 - 1	A
	460 - 1	680 - 1	680 - 01	680 - 01	680 - 1	B
	460 - 1	820 - 1-1/2	820 - 1-1/2	820 - 1-1/2	820 - 1-1/2	C
	460 - 1	820 - 2	820 - 2	820 - 2	820 - 2	D
VOR DME	680 - 1	560 - 1	560 - 1	560 - 1	780 - 1	A
	680 - 1	560 - 1	560 - 1	560 - 1	780 - 1-1/4	B
	820 - 1-1/2	560 - 1	560 - 1	560 - 1	780 - 1-1/2	C
	820 - 2	560 - 1-1/4	560 - 1-1/2	560 - 1-1/2	780 - 1-3/4	D
ILS	680 - 1	680 - 1	680 - 1	216 - 1/2	268 - 3/4	A
	680 - 1	680 - 1	680 - 1	216 - 1/2	268 - 3/4	B
	820 - 1-1/2	820 - 1-1/2	820 - 1-1/2	216 - 1/2	268 - 3/4	C
	820 - 2	820 - 2	820 - 2	216 - 1/2	268 - 3/4	D
LOC	680 - 1	680 - 1	820 - 2	466 - 3/4	580 - 1	A
	680 - 1	680 - 1	820 - 2	466 - 3/4	580 - 1	B
	820 - 1-1/2	820 - 1-1/2	820 - 2	466 - 3/4	580 - 1	C
	820 - 2	820 - 2	820 - 2	466 - 3/4	580 - 1-1/4	D
NDB	680 - 1	680 - 1	680 - 1	680 - 1	680 - 1	A
	680 - 1	680 - 1	680 - 1	680 - 1	680 - 1	B
	820 - 1-1/2	820 - 1-1/2	820 - 1-1/2	820 - 1-1/2	820 - 1-1/2	C
	820 - 2	820 - 2	820 - 2	820 - 2	820 - 2	D
LOC BC	680 - 1	420 - 1	420 - 1	420 - 1	420 - 1	A
	680 - 1	420 - 1	420 - 1	420 - 1	420 - 1	B
	820 - 1-1/2	420 - 1	420 - 1	420 - 1	420 - 1	C
	820 - 2	420 - 1	420 - 1	420 - 1	420 - 1	D
ASR	460 - 1	540 - 1	480 - 1/2	620 - 1/2	800 - 1	A
	460 - 1	540 - 1	480 - 1/2	620 - 1/2	800 - 1-3/4	B
	460 - 1	540 - 1	480 - 1/2	620 - 1/2	800 - 1-1/2	C
	460 - 1	540 - 1-1/4	480 - 1	620 - 1	800 - 1-3/4	D

It is possible that a different set of facilities may define the same approach on the same runway. For example, when lacking a DME, the necessary fixes can be established either with another DME or from bearing information solely. For this reason, the model contains more than one matrix of the form of Figure 5-10. The separate entries are a requirement to maintain unique program look-up logic.

MATRIX FULLWORD SAVEVALUE MINMA

Approach Type	ROW	A/C Category	COLUMN 1 (4R)	2 (27)	3 (22L)	4 (33L)	5 (15R)
			Runway Number				
VOR 1	1	1	680100	460100	680100	680100	680100
	2	2	680100	460100	680100	680100	680100
	3	3	820150	460100	820150	820150	820150
	4	4	820200	460100	820200	820200	820200
VOR DME 2	5	1	680100	680100	560100	680100	780100
	6	2	680100	680100	560100	680100	780125
	7	3	820150	820150	560100	820150	780150
	8	4	820200	820200	560125	820200	780175
ILS 3	9	1	216050	680100	680100	680100	268075
	10	2	216050	680100	680100	680100	268075
	11	3	216050	820150	820150	820150	268075
	12	4	216050	820200	820200	820200	268075
LOC 4	13	1	460075	680100	680100	680100	580100
	14	2	460075	680100	680100	680100	580100
	15	3	460075	820150	820150	820150	580100
	16	4	460075	820200	820200	820200	580125
NDB 5	17	1	680100	680100	680100	680100	680100
	18	2	680100	680100	680100	680100	680100
	19	3	820150	820150	820150	820150	820150
	20	4	820200	820200	820200	820200	820200
LOC BC 6	21	1	680100	680100	420100	680100	680100
	22	2	680100	680100	420100	680100	680100
	23	3	820150	820150	420100	820150	820150
	24	4	820200	820200	420100	820200	820200
ASR 7	25	1	620050	460100	540100	480050	800100
	26	2	620050	460100	540100	480050	800175
	27	3	620050	460100	540100	480050	800150
	28	4	620100	460100	540125	480100	800175

Approach Type

A/C Category

Minimum ceiling requirement (in feet)

Minimum visibility requirement (in 100ths of a mile)

Logan Minima Matrix

Figure 5-9. LANDING APPROACH MINIMA

Table 5-7. FACILITY-APPROACH DEFINITIONS -- BOSTON (LOGAN), RUNWAY 4R									
Facility	ID	Frequency	Approach Type						
			1	2	3	4	5	6	7
			VOR	VOR DME	ILS	LOC	NDB	LOC BC	ASR
LOC	I-BOS	110.3	0	0	15	15	0	15	0
LOC	I-LIP	110.7	0	0	0	0	0	0	0
LOC	I-MDC	110.7	0	0	0	0	0	0	0
GS			0	0	0	0	0	0	0
GS			0	0	10	0	0	0	0
GS			0	0	0	0	0	0	0
VOR	HTM	109.0	2	0	0	0	0	0	0
VOR	BOS	112.7	4	4	0	0	0	0	0
VOR	LWM	112.0	0	0	0	0	0	0	0
VOR	MHT	114.2	0	0	0	0	0	0	0
DME	BOS	Ch.27	0	7	7	7	0	7	0
NDB	SEW	382	0	0	0	0	35	35	0
ASR-7			0	0	0	0	0	0	37
LOM			0	0	19	0	19	0	0
MM			0	0	23	23	0	0	0
ALS			0	0	56	56	56	0	0
HIRL			0	0	43	43	0	0	0

MATRIX HALFWORD SAVEVALUEAIR03

	COL. 1	2	3	4	5	6	7	8
ROW 1	2	4	0	0	0	0	0	0
2	4	7	0	0	0	0	0	0
3	15	10	7	0	19	23	56	43
4	15	7	0	0	0	0	56	43
5	35	0	0	0	19	0	56	0
6	15	7	35	0	0	0	0	0
7	37	0	0	0	0	0	0	0

Approaches

Approach Definition Matrixes
(matrix AIR03 to matrix 161)

Facility number required up for approach to be used

HIRL facility number (if required by approach)

ALS facility number (if required by approach)

Middle marker facility number (if required by approach)

Outer marker facility number (if required by approach)

Figure 5-10. APPROACH DEFINITION MATRIX

5.1.11 MTBF and MTTR for Facility Status File

These two failure and repair parameters are required for each of the following facilities or functions. Table 5-8* shows the facilities carried in the Facility Status File. Figure 5-11 shows the program matrix.

Table 5-8. FACILITY FILE

Facility Number	Type	Location	ID	Frequency	Facility Number	Type	Location	ID	Frequency
1	VOR	Lawrence	LWM	112.0	33	SDF	Beverly	BVY	108.7
2	VOR	Whitman	HTM	109.0	34	SDF	Norwood	OWD	108.3
3	VOR	Manchester	MHT	114.2	35	NDB	Boston	SEW	382
4	VOR	Boston	BOS	112.7	36	TACAN	S. Weymouth	IAF	Ch.67
5	DME	Whitman		Ch.27	37	ASR	Boston		
6	DME	Manchester		Ch.89	38	ARSR	Boston		
7	DME	Boston		Ch.74	39	SECRA	Boston		
8	GS	Bedford			40	ARTS-3	Boston		
9	GS	Boston 15R			41	HIRL	Lawrence 5		
10	GS	Boston 4R			42	HIRL	Lawrence 23		
11	GS	Boston 33L			43	HIRL	Boston 4R		
12	LOC	Bedford	I-BED	109.5	44	HIRL	Boston 22L		
13	LOC	Lawrence	I-LWM	111.7	45	HIRL	Boston 15R		
14	LOC	Boston 15R	I-MDC	110.7	46	HIRL	Boston 33L		
15	LOC	Boston 4R	I-BOS	110.3	47	HIRL	Boston 9		
16	LOC	Boston 33L	I-LIP	110.7	48	HIRL	Boston 27		
17	LOM	Bedford	BE	332	49	FDEA	Boston		
18	LOM	Boston 15R	MD	375	50	DEDS	Boston		
19	LOM	Boston 4R	BO	221	51	FM	Beverly		
20	LOM	Boston 33L	LI	346	52	FM	Norwood		
21	MM	Bedford			53	NDB	Bedford	SKR	251
22	MM	Boston 15R			54	HIRL	Lawrence 5		
23	MM	Boston 4R			55	HIRL	Lawrence 23		
24	MM	Boston 22L			56	ALS	Boston 4R		
25	NDB	Beverly	TOF	269	57	ALS	Boston 33L		
26	NDB	Devens	DKO	352	58	HIRL	S. Weymouth 8		
27	NDB	S. Weymouth	IAF	236	59	HIRL	S. Weymouth 26		
28	NDB	Tew-Mac	HRX	402	60	HIRL	S. Weymouth 17		
29	NDB	Taunton	TAN	227	61	HIRL	S. Weymouth 35		
30	NDB	Plymouth	PYM	257	62	ALS	S. Weymouth 26		
31	NDB	Norwood	SOG	201	63	HIRL	Bedford 22		
32	NDB	Fitchburg	FIT	206					

*The data source is "Air Navigation and Air Traffic Control Facility Performance and Availability" (RIS:SM 6040-20), Report for Calendar Year 1975, prepared by the Airways Facilities Service, FAA, Washington, D.C.

MATRIX FULLWORD SAVEVALUE FACIL

Facility Status Matrix

Column 1 — Facility Status: 1-facility up; 0-facility down. Column 2 — MTBF in minutes. Column 3 — MTTR in minutes. Rows — Facility Number.

ROW	COLUMN 1	2	3
1	1	60300	318
2	1	60300	318
3	1	60300	318
4	1	60300	318
5	1	72300	402
6	1	24600	534
7	1	24600	534
8	1	28500	1260
9	1	28500	1260
10	1	28500	1260
11	1	28500	1260
12	1	23400	900
13	1	23400	900
14	0	23400	900
15	0	23400	900
16	0	23400	900
17	0	111900	1920
18	0	111900	1920
19	0	111900	1920
20	0	111900	1920
21	0	130500	2580
22	0	130500	2580
23	0	130500	2580
24	0	130500	2580
25	0	2100000	660
26	0	2100000	660
27	0	2100000	660
28	0	2100000	660
29	0	2100000	660
30	0	2100000	660
31	0	2100000	660
32	0	2100000	660
33	0	2100000	660
34	0	2100000	660
35	0	2100000	660
36	0	24600	534
37	0	36300	96
38	0	5160	180
39	0	29100	120
40	0	20100	114
41	0	25200	780
42	0	25200	780
43	0	25200	780
44	0	25200	780
45	0	25200	780
46	0	25200	780
47	0	25200	780
48	0	25200	780
49	0	2100000	616
50	0	2100000	616
51	0	2100000	660
52	0	2100000	660
53	0	2100000	660
54	0	25200	780
55	0	25200	780
56	0	25200	780
57	0	25200	780
58	0	25200	780
59	0	25200	780
60	0	25200	780
61	0	25200	780
62	0	25200	780
63	0	25200	780

Figure 5-11. FACILITY STATUS FILE

5.1.12 Table of Trail Separation and Numbers of Aircraft per Controller

Table 3-2 in Chapter Three lists the data used in this model. Figure 5-12 shows the same data as an input matrix.

MATRIX HALFWORD SAVEVALUEARSEP

	ROW	COL. 1	2	3	4	5	6	7	8	9	10	11
Radar Conditions	1	37	39	40	38	3	1	2	3	0	1	20
	2	37	39	40	0	3	1	2	3	0	1	20
	3	37	39	0	38	3	1	2	3	0	1	16
	4	37	39	0	0	3	1	2	3	0	1	16
	5	37	0	40	38	4	0	1	2	0	0	10
	6	37	0	40	0	4	0	1	2	0	0	10
	7	37	0	0	38	4	0	1	2	0	0	12
	8	37	0	0	0	4	0	1	2	0	0	12
	9	0	39	40	38	3	1	2	3	0	1	20
	10	0	39	40	0	3	1	2	3	0	1	20
	11	0	39	0	38	5	0	0	1	0	0	16
	12	0	39	0	0	5	0	0	1	0	0	16
	13	0	0	40	38	5	0	0	1	0	0	10
	14	0	0	0	38	5	0	0	1	0	0	8
Non-Radar Conditions	15	0	0	40	0	12	0	0	1	0	0	10
	16	0	0	0	0	12	0	0	1	0	0	8

Columns 1–4: Equipment required up to determine which separation criteria to use (row number)

Column 5: Required separation in miles

Columns 6–10: Additional separation in miles for various weights of aircraft

Column 11: Number of aircraft air control can handle at one time

Figure 5-12. SEPARATION MATRIX

5.1.13 Airport Definition Data

Figure 5-13 displays the matrix used by the model to define the airport layout. Two different matrix formats are used, one for a principal airport such as Logan, and another for the secondary airports. The matrices are self-explanatory. One note of importance is that the field elevation number is used in conjunction with the minima tables to determine ceiling heights above the ground.

5.2 *MODEL OUTPUTS*

As was mentioned in Chapter Three, the model produces three kinds of output data:

Output data of the run; i.e., delay data

Program administrative data

Current values of program parameters.

Logan Definition Matrix

MATRIX HALFWORD SAVEVALUEAIR01

ROW	COL. 1	2	3	4
1	18	0	24	19
2	13	7	23	7
3	1	40	133	1
4	1	40	134	1
5	2	270	135	1
6	2	270	136	1
7	3	220	137	1
8	3	220	138	1
9	4	330	139	1
10	4	330	140	1
11	5	150	141	1
12	5	150	142	1
13	4	330	139	1
14	4	330	140	1
15	1	40	133	1
16	1	40	134	1
17	3	220	137	1
18	3	220	138	1

Number of rows in this matrix
Operating hours of Logan
Daylight hours definition
Elevation in feet
Number of approaches
Day runway priorities
Night runway priorities
Matrix number of minima matrix
Matrix number of approach definition matrix

Row in which night runway selections starts

Runway number (user-assigned)

Runway direction in degrees

Airport Definition Matrix (General Case)				
Row \ Column	1	2	3	4
1	Number of Rows (n)	Opening Time	Closing Time	Elevation (in feet)
2	Night Runways (M)	Day Start	Night Start	Number of Approaches
Day matrix: 3 . . . M-1	Runway Number (Consecutive)	Runway Direction (Degrees)	Approach Matrix Number	Minima Matrix Number
Night matrix: M . . . n				

Figure 5-13. FIELD DEFINITION MATRIX

5.2.1 Delay Data

The delay matrix and its contents were described and discussed in Section 3.6, Chapter Three.

5.2.2 Program Administrative Data

Block Counts (Figure 5-14) show the number of transactions that passed through each block in the model. The figure gives the number of transactions that passed through the block, under the "TOTAL" columns, and the number of transactions presently at the block, under the columns labelled "CURRENT".

User Chain Data (Figure 5-15) is an example of this printout. Three user chains, or queues, are shown. Four may actually appear, depending on events within the program. The user chain identified as "LDSCD" is the landing schedule for the primary runway. If a secondary runway were used during a program run, the symbol "2" would be printed under LDCSCD -- this is the fourth possible chain. HDARC is the user chain used for the holding fixes; TAKOF represents the take-off queue.

The column labelled "AVERAGE TIME/TRANS" gives the average time the transaction remains in the queue. The very low time associated with LDSCD is, again, reflective of the fact that a transaction may be placed on the chain several times before a vacancy is found. For the other two chains these numbers may be thought of as average waiting times, with one proviso. The HDARC queue is not as active as LDSCD; nonetheless, the same transaction may appear more than once on their chain. Only TAKOF has the property that a transaction can enter only once.

The column labelled "CURRENT CONTENTS" is self explanatory, as are the columns labelled "AVERAGE CONTENTS" and "MAXIMUM CONTENTS".

5.2.3 Current Contents of Program Parameters

Figure 5-16 is a typical printout of program parameters. The output "Contents of Halfword Savevalues" gives the present value of all non-zero halfword savevalues.* Most of these outputs are input data or dummy counters used in the model; however, the user may input savevalues of his own to gather data of interest. The following is a partial list of outputs of interest:

<u>ARSEP</u> - Row of present separation assignment

<u>WNDIR</u> - Wind direction in degrees at current clock time

<u>WNVEL</u> - Wind velocity in knots at current clock time

<u>VISAB</u> - Visibility in (miles/100) at current clock time

<u>ACNOM</u> - Number of aircraft created

<u>ACCTR</u> - Number of aircraft landing at primary airport

<u>ARCGO</u> - Number of aircraft under air control at current clock time

<u>TAKOF</u> - Number of aircraft that took off.

---

*A halfword savevalue is a GPSS term for a 2-byte program variable.

Block printout prints, for each GPSS statement number, the number of transactions currently at each block, and the total number of transactions passing through that block.

ERRCR NO. 599
TRANS 22 FRCM 451 TO 466 CLOCK 1 TERMINATIONS TO GO 1
BLOCK COUNTS

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
1	0	1	11	0	1	21	0	1	31	0	1	41	0	7
2	0	2	12	0	6	22	0	1	32	0	0	42	0	7
3	0	2	13	0	6	23	0	1	33	0	0	43	0	6
4	0	1	14	0	1	24	0	1	34	0	0	44	0	1
5	0	1	15	0	1	25	0	1	35	0	0	45	0	1
6	0	1	16	0	2	26	0	1	36	0	1	46	0	1
7	0	1	17	0	2	27	0	1	37	0	1	47	0	1
8	0	0	18	0	2	28	0	1	38	0	1	48	0	0
9	0	0	19	0	1	29	0	1	39	0	1	49	0	1
10	0	0	20	0	1	30	0	1	40	0	1	50	0	1
BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
51	0	1	61	0	0	71	0	0	81	0	0	91	0	0
52	0	1	62	0	0	72	0	1	82	0	0	92	0	0
53	0	1	63	0	0	73	0	1	83	0	0	93	0	0
54	0	1	64	0	0	74	1	1	84	0	0	94	0	0
55	0	1	65	0	0	75	0	0	85	0	0	95	0	0
56	0	1	66	0	1	76	0	1	86	1	2	96	0	0
57	1	1	67	1	1	77	1	2	87	0	1	97	0	0
58	0	0	68	0	0	78	0	0	88	0	1	98	0	0
59	0	1	69	0	1	79	0	0	89	0	1	99	0	0
60	0	1	70	0	1	80	0	0	90	1	1	100	0	0
BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
101	0	0	111	0	0	121	0	0	131	0	0	141	0	0
102	0	0	112	0	0	122	0	0	132	0	0	142	0	0
103	0	0	113	0	0	123	0	0	133	0	0	143	0	0
104	0	0	114	0	0	124	0	0	134	0	0	144	0	0
105	0	0	115	0	0	125	0	0	135	0	0	145	0	0
106	0	0	116	0	0	126	0	0	136	0	0	146	0	0
107	0	0	117	0	0	127	0	0	137	0	0	147	0	0
108	0	0	118	0	0	128	0	0	138	0	0	148	0	0
109	0	0	119	0	0	129	0	0	139	0	0	149	0	0
110	0	0	120	0	0	130	0	0	140	0	0	150	0	0
BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
151	0	0	161	0	0	171	0	0	181	0	0	191	0	0
152	0	0	162	0	0	172	0	0	182	0	0	192	0	0
153	0	0	163	0	0	173	0	0	183	0	0	193	0	0
154	0	0	164	0	0	174	0	0	184	0	0	194	0	0
155	0	0	165	0	0	175	0	0	185	0	0	195	0	0
156	0	0	166	0	0	176	0	0	186	0	0	196	0	0
157	0	0	167	0	0	177	0	0	187	0	0	197	0	0
158	0	0	168	0	0	178	0	0	188	0	0	198	0	0
159	0	0	169	0	0	179	0	0	189	0	0	199	0	0
160	0	0	170	0	0	180	0	0	190	0	0	200	0	0
BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
201	0	0	211	0	0	221	0	0	231	0	0	241	0	0
202	0	0	212	0	0	222	0	0	232	0	0	242	0	0
203	0	0	213	0	0	223	0	0	233	0	0	243	0	0
204	0	0	214	0	0	224	0	0	234	0	0	244	0	0
205	0	0	215	0	0	225	0	0	235	0	0	245	0	0
206	0	1	216	0	0	226	0	0	236	0	0	246	0	0
207	0	1	217	0	0	227	0	0	237	0	0	247	0	0
208	0	1	218	0	0	228	0	0	238	0	0	248	0	0
209	1	1	219	0	0	229	0	0	239	0	0	249	0	0
210	0	0	220	0	0	230	0	0	240	0	0	250	0	0

Figure 5-14. BLOCK COUNTS

USER CHAIN	TOTAL ENTRIES	AVERAGE TIME/TRANS	CURRENT CONTENTS	AVERAGE CONTENTS	MAXIMUM CONTENTS
LCSCO	57661	.258	1	10.363	20
HDARC	665	7.458		3.444	34
TAKCF	588	2.528		1.032	9

Figure 5-15. USER CHAIN DATA

CONTENTS OF HALFWORD SAVEVALUES (NON-ZERO)

SAVEVALUE NR,	VALUE	NR,	VALUE	NR,	VALUE	NR,	VALUE	NR,	VALUE	NR,	VALUE	NR,	VALUE	NR,	VALUE
RUNWY	5	DIVRT	500	AIPPT	18	HOLD	5	NORAD	15	RADDW	16	TOF	10	WNMAX	15
MAXTY	30	TAKQU	3	LNDST	5	MNONE	-1	LNDSP	2	TAKVS	100	TAKCL	375	CALM	5
TYPCT	2	IFRWT	1	DIRWN	-70	LNDVL	129	CEILT	467	VISAT	150	WNVEL	10	CEIL	600
VISAB	150	ARSEP	9	ACNUM	751	ACCTR	665	ARCGO	1	TAKOF	588	DUMMY	2	LEDWT	3

Figure 5-16. NON-ZERO HALFWORD SAVEVALUES

A complete list of halfword savevalues is given in Chapter Six. The Matrix FACIL inputs the MTBF and MTTR for each facility. Column 1 is the present status of each facility -- 1 indicates facility operational; 0 indicates facility down. This matrix is shown in Figure 5-17.

5.3 RESTRICTIONS AND/OR LIMITATIONS

The basic cycling interval for the UDCM is one minute. This means that every clock GPSS pulse is interpreted as one minute of simulated real time. The use of a one-minute clock implies an analytic error in calculation because all calculations involving time are integer quantities. For example, any calculation, such as a distance divided by a speed, will truncate downward to the next lower integer, and all times between 4.0 and 4.999 minutes, for example, will be interpreted as 4 minutes. Thus the same time of flight would be obtained over a range of distances and/or velocities. Obviously, then, some error is built into the model. This could be reduced by allowing one clock pulse to stand for .1 or .01 minute, or any other fraction of a minute. Such reduction would, however, increase the model's already tight core constraints, since, in order to obtain runs of any reasonable simulated duration, the halfword savevalues and matrices would have to be increased to fullword values.

5.4 EDITING AND DIAGNOSTICS

With the exception of the ERR statement, which is used for debug purposes in the takeoff and landing schedules, all error outputs and program diagnostics are standard GPSS. When the error statement is reached in the model the UDCM stops and prints output error statistics. It is only reached when an anomaly exists in the model logic, i.e., when a transaction twin* cannot be found.

*A transaction twin is an exact duplicate of a GPSS transaction.

MATRIX FULLWORD SAVEVALUE FACIL

ROW	COLUMN 1
1	1
2	1
3	1
4	1
5	1
6	1
7	1
8	1
9	1
10	1
11	1
12	1
13	1
14	1
15	1
16	1
17	1
18	1
19	1
20	1
21	1
22	1
23	1
24	1
25	1
26	1
27	1
28	1
29	1
30	1
31	1
32	1
33	1
34	1
35	1
36	1
37	0
38	1
39	1
40	1
41	1
42	1
43	1
44	1
45	1
46	1
47	1
48	1
49	1
50	1
51	1
52	1
53	1
54	1
55	1
56	1
57	1
58	1
59	1
60	1
61	1
62	1
63	1

Figure 5-17. MATRIX FACIL

CHAPTER SIX

SYMBOLS

All symbols, variables, and matrices appear in the program listing, shown in Appendix A, and are summarized in this chapter for convenience.

6.1 MATRIX SAVEVALUES

Halfword

DSTN - Contains distance from holding fixes and secondary airports to Logan runway thresholds, radar environment.

DSTNR - Same as DSTN, but for all radar facilities down.

VFRAC - Contains cumulative probabilities for aircraft assignment to Logan holding fixes and secondary airports. Also, in last column, contains aircraft arrival rates. VFR conditions.

IFRAC - Same as VFRAC, except IFR conditions.

CATWT - Contains cumulative probabilities for assignment of aircraft weight and landing categories, by aircraft user type.

VFRPT - Contains cumulative probabilities for assignment of aircraft type, given the destination, VFR.

IFRPT - Same as VFRPT, except IFR conditions.

DIRVL - Contains cumulative probabilities to assign wind direction and speed.

DELAY - Output delay matrix.

ARSEP - Contains nominal and incremental trail separation distances as a function of radar status. Also contains numbers of aircraft a controller can handle.

AIRO1
AIRO2 } Contain airport definition data, facilities required for approaches, and approach definitions.
AIRO3

Fullword

FACIL - Define facilities by number, MTBF, MTTR, and current status.

MINMA - Contains minima for each airport runway and approach.

6.2 HALFWORD SAVEVALUE SYMBOLS

ACCTR - Accumulator used to count aircraft going to Logan

ACNUM - Counts aircraft created

AIRPT - Number of holding fixes and secondary airports

ARCGO - Counter used to count number of aircraft under air control

ARSEP - Pointer used to determine which row of the separation matrix is in use

CALM - Maximum wind speed for calm

CEIL - Present ceiling in feet

CEILP - Present ceiling column number

CEILT - Dummy counter used to manipulate the ceiling

DAYEN - End of day, time, for weather determination

DAYST - Start of day, time, for weather determination

DIRWN - Dummy counter used to manipulate the wind direction and runway direction

DIVRT - Number, out of 1000 aircraft, that divert to Logan from secondary airport

ERROR - Dummy counter used to bomb model if an impossible situation exists

FACIL - Number of facilities modeled

HOLD - Number of Logan holding fixes

IFRWT - Dummy counter is equal to zero in VFR and one if IFR conditions

LEDWT - Dummy counter used to store the lead aircraft's weight

LNDSP - Separation in miles between landing and taking off aircraft

LNDST - Separation increase if takeoff queue is greater than TAKQU

LNDVL - Dummy counter used to store the approach aircraft's landing velocity

MAXTM - Maximum holding time

MNONE - Dummy input

NORAD - Row number in the separation matrix where no radar condition exists

RADOW - Last row in separation matrix

RUNWY - The number of runways at Logan

TAKCL - Maximum takeoff ceiling

TAKOF - Departing aircraft counter

TAKQU - Maximum number of aircraft in takeoff queue before landing separation increases

TAKVS - Minimum takeoff visibility

TOF - Time of flight from holding fix or secondary airport to Logan

TRLVL - Dummy counter used to store trailing aircraft velocity

TRLWT - Dummy counter used to store trailing aircraft weight

TYPCT - Dummy counter used in the generation of aircraft

VFRWT - Dummy counter is equal to zero in IFR and one in VFR conditions

VISAB - Present visibility in miles

VISAP - Present visibility in column number

VISAT - Dummy counter used to manipulate the visibility

WNDIR - Present wind direction in degrees

WNMAX - Wind speed above which aircraft land on runway closest to the wind

WNVEL - Present wind velocity

WTCHG - Mean time between major weather change

WTVAR - Mean time between minor weather change.

6.3 BOOLEAN VARIABLE SYMBOLS

CLRD - Boolean variable used to find approaching aircraft

LEDAC - Boolean variable used to find lead aircraft

TRLAC - Boolean variable used to find trailing aircraft

WEATH - Boolean variable used to determine if weather is below minimum for approach in question.

6.4 FUNCTION SYMBOLS

CEIL - Function converts column number to ceiling in feet

LOGRN - Function converts random number into a logarithm of the random number

MODSP - Function defines the modifier and spread of aircraft turnaround time

PMFTY - Function randomly chooses between 50 and 150

PMOFY - Function randomly chooses between 150 and 300

SPEED - Function defines speed of aircraft based on aircraft type

VISAB - Function converts column number to visibility in miles

WNVEL - Function converts column number to wind velocity.

6.5 CHAIN SYMBOLS

HDARC - Hold area chain

LDSCD - Landing schedule chain (1 - primary runway, 2 - secondary runway)

TAKOF - Departure chain.

6.6 LOGIC SWITCH SYMBOLS

ARCGO - Logic switch is set when air control can accept aircraft

CHANG - Logic switch is set when there is a change in facility status or weather

CLRD - Logic switch is set when aircraft is allowed to take off

ENTER - Logic switch is set when an aircraft is in the hold area

FCHAN - Logic switch is set when there is a change in facility status

FINI1 - Logic switch which allows only one transaction at a time to examine the landing schedule.

FINI2 - Logic switch prevents next generated aircraft into the system until previous aircraft is in the system

FINI3 - Logic switch used to hold an aircraft transaction until trail aircraft statistics are gathered

FINI4 - Logic switch used to hold an aircraft transaction until lead aircraft statistics are gathered

FINI5 - Logic switch used to allow aircraft into the landing schedule before air control checks next aircraft

FINI6 - Logic switch prevents generation of aircraft until all facilities are created

LNDSP - Logic switch prevents aircraft takeoff on land runway until landing aircraft has cleared

TAKOF - Logic switch is set when proper separation is experienced between taking off aircraft.

6.7 VARIABLE SYMBOLS

APPCT - Dummy variable used to store row number of minima matrix based on aircraft category

ARSEP - Variable used to calculate separation between lead aircraft and aircraft of interest

CEIL - Variable used to modify ceiling ±50 feet

CEILO - Variable used to modify ceiling ±150 feet

CEILT - Variable used to convert minima matrix entry into feet of ceiling

CLOCK - Variable which converts the computer clock time into simulated hour in the day

DELAY - Variable used to determine if an aircraft has experienced any delay

DELTM, DELT1, DELT2 - Variables used to determine elapsed time between aircraft arrivals

DESTN, DEST1 - Variables used to determine aircraft destination

DIRWN - Dummy variable used to square difference between wind direction and runway direction

LNDSP - Variable used to calculate the approaching aircraft distance from touch down

MORWN - Dummy variable used to change the sign of the wind direction off the runway direction

MOD - Variable used to calculate the turnaround time of a landing aircraft

MTBF - Variable used to determine the minutes until next failure for a facility

MTTR - Variable used to determine the minutes required to repair a downed facility

SEPAR - Variable used to calculate separation between aircraft of interest and trailing aircraft

SPRED - Variable used to put a spread on the variable MOD

TAKDY - Variable used to determine if an aircraft experienced any delay during takeoff

TOF - Variable used to calculate the time of flight of an aircraft in a radar environment

TOFNR - Variable used to calculate the time of flight of an aircraft in a non-radar environment

TYPEA } Variables used to assign an aircraft type based on the aircraft
TYPED } destination

VISAB - Variable used to vary the visibility $\pm.25$ miles

VISAT - Variable used to convert minima matrix entry into miles of visibility

WTCHG - Variable used to determine the number of minutes until the next major weather change

WTVAR - Variable used to determine the number of minutes until the next minor weather variation.

6.8 SAVEVALUE SYMBOLS

LEDTM - Dummy counter used to store lead aircraft landing time

LNDTM - Dummy counter used to store approach aircraft landing time

TESS - Dummy counter used to store wind direction

TMCTR - Dummy counter used to store aircraft landing time

TRLTM - Dummy counter used to store trailing aircraft landing time.

APPENDIX A

PROGRAM PRINTOUT

```
// JOB 1324  LOGAN SIMULATION   MARTIN STERNBERG-POWIDZKI                DATE 11/01/76,CLOCK 02/01/16
// ASSGN SYS000,X'131'
// ASSGN SYS001,X'131'
// ASSGN SYS002,X'131'
// ASSGN SYS003,X'131'
// DLBL IJSYS00,'SYSTEM WORK FILE NO. 0',0,SD
// EXTENT SYS000,999999,1,0,00020,00600
// DLBL INTER0I,'SYSTEM WORK FILE NO. 0',0,SD
// EXTENT SYS000,999999,1,0,00020,00600
// DLBL IJSYS01,'SYSTEM WORK FILE NO. 1',0,SD
// EXTENT SYS001,999999,1,0,00620,01200
// DLBL SIMIN1I,'SYSTEM WORK FILE NO. 1',0,SD
// EXTENT SYS001,999999,1,0,00620,01200
// DLBL IJSYS02,'SYSTEM WORK FILE NO. 2',0,SD
// EXTENT SYS002,999999,1,0,01820,00600
// DLBL SYMTABI,'SYSTEM WORK FILE NO. 2',0,SD
// EXTENT SYS002,999999,1,0,01820,00600
// DLBL IJSYS03,'SYSTEM WORK FILE NO. 3',0,SD
// EXTENT SYS003,999999,1,0,02420,01200
// DLBL REPORGI,'SYSTEM WORK FILE NO. 3',0,SD
// EXTENT SYS003,999999,1,0,02420,01200
// EXEC DAR01V2
```

REALLOCATE XAC,300		1
REALLOCATE BLO,490		2
REALLOCATE FAC,0		3
REALLOCATE FSV,5		4
REALLOCATE VAR,31		5
REALLOCATE LOG,14		6
REALLOCATE CHA,4		7
REALLOCATE FUN,12		8
REALLOCATE FMS,15		9
REALLOCATE HMS,165		10
REALLOCATE GRP,0		11
REALLOCATE STO,0		12
REALLOCATE QUE,0		13
REALLOCATE TAB,0		14
REALLOCATE BVR,5		15
REALLOCATE HSV,45		16

BLOCK NUMBER	*LOC	OPERATION	A,B,C,D,E,F,G	COMMENTS	CARD NUMBER
		SIMULATE	30		17
	LDSCD	EQU	1(2),C		18
	MINMA	EQU	1(14),M	Assigns numbers to GPSS entity names.	19
	AIR01	EQU	101(1),Y		20
	AIR03	EQU	133(29),Y		21
	AIR02	EQU	106(13),Y		22
	SPEED	EQU	1(4),Z		23
	DIRVL	EQU	1(5),Y		24
	1	MATRIX	H,18,13		25
	2	MATRIX	H,6,10		26
	4	MATRIX	H,6,10		27
	6	MATRIX	H,6,10		28
	8	MATRIX	H,6,10		29
	10	MATRIX	H,6,10		30
	12	MATRIX	H,6,10		31
	14	MATRIX	H,6,10		32
	16	MATRIX	H,6,10		33
	18	MATRIX	H,6,10		34
	20	MATRIX	H,6,10		35
	22	MATRIX	H,6,10		36
	24	MATRIX	H,6,10		37
	26	MATRIX	H,6,10		38
	28	MATRIX	H,6,10		39
	30	MATRIX	H,6,10		40
	32	MATRIX	H,6,10		41
	34	MATRIX	H,6,10		42
	3	MATRIX	H,6,14		43
	5	MATRIX	H,6,14		44
	7	MATRIX	H,6,14	Defines matrixes, rows and columns, size, and halfword or fullword.	45
	9	MATRIX	H,6,14	Halfword allows entries up to $(2^{15} - 1)$.	46
	11	MATRIX	H,6,14	Fullword allows entries up to $(2^{31} - 1)$.	47
	13	MATRIX	H,6,14		48
	15	MATRIX	H,6,14		49
	17	MATRIX	H,6,14		50
	19	MATRIX	H,6,14		51
	21	MATRIX	H,6,14		52
	23	MATRIX	H,6,14		53
	25	MATRIX	H,6,14		54
	27	MATRIX	H,6,14		55
	29	MATRIX	H,6,14		56

(continued)

```
31      MATRIX     H,6,14
33      MATRIX     H,6,14
35      MATRIX     H,6,14
158     MATRIX     H,2,8
157     MATRIX     H,2,8
111     MATRIX     H,4,4
112     MATRIX     H,4,4
113     MATRIX     H,4,4
117     MATRIX     H,4,4
118     MATRIX     H,6,4
106     MATRIX     H,6,4
107     MATRIX     H,6,4
109     MATRIX     H,6,4
110     MATRIX     H,6,4
114     MATRIX     H,6,4
115     MATRIX     H,6,4
116     MATRIX     H,6,4
108     MATRIX     H,5,4
101     MATRIX     H,18,4
148     MATRIX     H,2,8
149     MATRIX     H,1,8
150     MATRIX     H,1,8
151     MATRIX     H,4,8
152     MATRIX     H,1,8
153     MATRIX     H,3,8
159     MATRIX     H,3,8
160     MATRIX     H,3,8
161     MATRIX     H,3,8
154     MATRIX     H,3,8
155     MATRIX     H,2,8
133     MATRIX     H,7,8
134     MATRIX     H,7,8
135     MATRIX     H,7,8
136     MATRIX     H,7,8
137     MATRIX     H,7,8
138     MATRIX     H,7,8
139     MATRIX     H,7,8
140     MATRIX     H,7,8
141     MATRIX     H,7,8
142     MATRIX     H,7,8
143     MATRIX     H,5,8
156     MATRIX     H,5,8
144     MATRIX     H,4,8
145     MATRIX     H,1,8
146     MATRIX     H,1,8
147     MATRIX     H,2,8
DSTN    MATRIX     H,6,18
DSTNR   MATRIX     H,5,18
VFRAC   MATRIX     H,24,19
IFRAC   MATRIX     H,24,18
CATWT   MATRIX     H,4,7
VFRPT   MATRIX     H,18,3
IFRPT   MATRIX     H,18,3
ARSEP   MATRIX     H,16,11
DELAY   MATRIX     H,13,4
FACIL   MATRIX     X,63,3
1       MATRIX     X,28,5
2       MATRIX     X,20,4
3       MATRIX     X,16,4
4       MATRIX     X,4,4
5       MATRIX     X,4,4
6       MATRIX     X,8,4
7       MATRIX     X,8,2
8       MATRIX     X,4,2
9       MATRIX     X,4,2
10      MATRIX     X,16,4
11      MATRIX     X,4,4
12      MATRIX     X,12,4
13      MATRIX     X,12,2
14      MATRIX     X,8,4
```

Defines matrixes, rows and columns, size, and halfword or fullword.
Halfword allows entries up to $(2^{15} - 1)$.
Fullword allows entries up to $(2^{31} - 1)$.

```
INITIAL    MX$FACIL(1-4,2),60300
INITIAL    MX$FACIL(1-4,3),318
INITIAL    MX$FACIL(5,2),72300
INITIAL    MX$FACIL(5,3),402
INITIAL    MX$FACIL(6-7,2),24600
INITIAL    MX$FACIL(6-7,3),534
INITIAL    MX$FACIL(8-11,2),28500
INITIAL    MX$FACIL(8-11,3),1260
INITIAL    MX$FACIL(12-16,2),23400
INITIAL    MX$FACIL(12-16,3),900
INITIAL    MX$FACIL(17-20,2),111900
INITIAL    MX$FACIL(17-20,3),1920
INITIAL    MX$FACIL(21-24,2),130500
INITIAL    MX$FACIL(21-24,3),2580
```

Initializes the Facility Matrix with MTBFs and MTTRs.

(continued)

```
INITIAL    MX$FACIL(25-35,2),2100000
INITIAL    MX$FACIL(25-35,3),660
INITIAL    MX$FACIL(36,2),24600
INITIAL    MX$FACIL(36,3),534
INITIAL    MX$FACIL(37,2),36300
INITIAL    MX$FACIL(37,3),96
INITIAL    MX$FACIL(38,2),5160          Initializes the Facility Matrix with MTBFs and MTTRs.
INITIAL    MX$FACIL(38,3),180
INITIAL    MX$FACIL(39,2),29100
INITIAL    MX$FACIL(39,3),120
INITIAL    MX$FACIL(40,2),20100
INITIAL    MX$FACIL(40,3),114
INITIAL    MX$FACIL(41-48,2),25200
INITIAL    MX$FACIL(49-50,2),2100000
INITIAL    MX$FACIL(54-55,2),25200
INITIAL    MX$FACIL(58-61,2),25200
INITIAL    MX$FACIL(63,2),25200
INITIAL    MX$FACIL(41-48,3),780
INITIAL    MX$FACIL(49-50,3),616
INITIAL    MX$FACIL(54-55,3),780
INITIAL    MX$FACIL(58-61,3),780
INITIAL    MX$FACIL(63,3),780
INITIAL    MX$FACIL(51-53,2),2100000
INITIAL    MX$FACIL(51-53,3),660
INITIAL    MX$FACIL(56-57,2),25200
INITIAL    MX$FACIL(56-57,3),780
INITIAL    MX$FACIL(62,2),25200
INITIAL    MX$FACIL(62,3),780
INITIAL    MH$DSTN(1,1),34
INITIAL    MH$DSTN(1,2),25
INITIAL    MH$DSTN(1,3),19
INITIAL    MH$DSTN(1,4),31
INITIAL    MH$DSTN(1,5),49
INITIAL    MH$DSTN(1,6),27
INITIAL    MH$DSTN(1,7),36       Initializes the Distance Matrix [distance from
INITIAL    MH$DSTN(1,8),46       holding points and secondary airports to the 5
INITIAL    MH$DSTN(1,9),39       runways at Logan (radar environment)].
INITIAL    MH$DSTN(1,10),46
INITIAL    MH$DSTN(1,11),22
INITIAL    MH$DSTN(1,12),29
INITIAL    MH$DSTN(1,13),55
INITIAL    MH$DSTN(1,14),12
INITIAL    MH$DSTN(1,15),33
INITIAL    MH$DSTN(1,16),14
INITIAL    MH$DSTN(1,17),30
INITIAL    MH$DSTN(1,18),38
INITIAL    MH$DSTN(2,1),39
INITIAL    MH$DSTN(2,2),45
INITIAL    MH$DSTN(2,3),41
INITIAL    MH$DSTN(2,4),18
INITIAL    MH$DSTN(2,5),33
INITIAL    MH$DSTN(2,6),16
INITIAL    MH$DSTN(2,7),22
INITIAL    MH$DSTN(2,8),37
INITIAL    MH$DSTN(2,9),31
INITIAL    MH$DSTN(2,10),25
INITIAL    MH$DSTN(2,11),22
INITIAL    MH$DSTN(2,12),29
INITIAL    MH$DSTN(2,13),34
INITIAL    MH$DSTN(2,14),12
INITIAL    MH$DSTN(2,15),33
INITIAL    MH$DSTN(2,16),14
INITIAL    MH$DSTN(2,17),30
INITIAL    MH$DSTN(2,18),38
INITIAL    MH$DSTN(3,1),33
INITIAL    MH$DSTN(3,2),45
INITIAL    MH$DSTN(3,3),41
INITIAL    MH$DSTN(3,4),20
INITIAL    MH$DSTN(3,5),26
INITIAL    MH$DSTN(3,6),26
INITIAL    MH$DSTN(3,7),16
INITIAL    MH$DSTN(3,8),38
INITIAL    MH$DSTN(3,9),43
INITIAL    MH$DSTN(3,10),23
INITIAL    MH$DSTN(3,11),47
INITIAL    MH$DSTN(3,12),36
INITIAL    MH$DSTN(3,13),28
INITIAL    MH$DSTN(3,14),43
INITIAL    MH$DSTN(3,15),45
INITIAL    MH$DSTN(3,16),35
INITIAL    MH$DSTN(3,17),49
INITIAL    MH$DSTN(3,18),24
INITIAL    MH$DSTN(4,1),50
INITIAL    MH$DSTN(4,2),29
INITIAL    MH$DSTN(4,3),25
INITIAL    MH$DSTN(4,4),20
```

(continued)

```
INITIAL     MH$DSTN(4,5),44
INITIAL     MH$DSTN(4,6),43
INITIAL     MH$DSTN(4,7),35
INITIAL     MH$DSTN(4,8),68
INITIAL     MH$DSTN(4,9),63
INITIAL     MH$DSTN(4,10),43
INITIAL     MH$DSTN(4,11),29
INITIAL     MH$DSTN(4,12),20
INITIAL     MH$DSTN(4,13),40
INITIAL     MH$DSTN(4,14),26
INITIAL     MH$DSTN(4,15),29
INITIAL     MH$DSTN(4,16),30
INITIAL     MH$DSTN(4,17),32
INITIAL     MH$DSTN(4,18),49
INITIAL     MH$DSTN(5,1),25
INITIAL     MH$DSTN(5,2),32
INITIAL     MH$DSTN(5,3),47
INITIAL     MH$DSTN(5,4),41
INITIAL     MH$DSTN(5,5),26
INITIAL     MH$DSTN(5,6),16
INITIAL     MH$DSTN(5,7),22
INITIAL     MH$DSTN(5,8),37
INITIAL     MH$DSTN(5,9),31
INITIAL     MH$DSTN(5,10),25
INITIAL     MH$DSTN(5,11),36
INITIAL     MH$DSTN(5,12),51
INITIAL     MH$DSTN(5,13),34
INITIAL     MH$DSTN(5,14),34
INITIAL     MH$DSTN(5,15),55
INITIAL     MH$DSTN(5,16),35
INITIAL     MH$DSTN(5,17),52
INITIAL     MH$DSTN(5,18),17
INITIAL     MH$DSTN(6,1-5),101
INITIAL     MH$DSTN(6,6),106
INITIAL     MH$DSTN(6,7),107
INITIAL     MH$DSTN(6,8),108
INITIAL     MH$DSTN(6,9),109
INITIAL     MH$DSTN(6,10),110
INITIAL     MH$DSTN(6,11),111
INITIAL     MH$DSTN(6,12),112
INITIAL     MH$DSTN(6,13),113
INITIAL     MH$DSTN(6,14),114
INITIAL     MH$DSTN(6,15),115
INITIAL     MH$DSTN(6,16),116
INITIAL     MH$DSTN(6,17),117
INITIAL     MH$DSTN(6,18),118
```

Initializes the Distance Matrix [distance from holding points and secondary airports to the 5 runways at Logan (radar environment)].

```
INITIAL     MH$DSTNR(1,1),26
INITIAL     MH$DSTNR(1,2),49
INITIAL     MH$DSTNR(1,3),39
INITIAL     MH$DSTNR(1,4),55
INITIAL     MH$DSTNR(1,5),26
INITIAL     MH$DSTNR(1,6),15
INITIAL     MH$DSTNR(1,7),14
INITIAL     MH$DSTNR(1,8),38
INITIAL     MH$DSTNR(1,9),49
INITIAL     MH$DSTNR(1,10),27
INITIAL     MH$DSTNR(1,11),34
INITIAL     MH$DSTNR(1,12),31
INITIAL     MH$DSTNR(1,13),27
INITIAL     MH$DSTNR(1,14),28
INITIAL     MH$DSTNR(1,15),31
INITIAL     MH$DSTNR(1,16),28
INITIAL     MH$DSTNR(1,17),45
INITIAL     MH$DSTNR(1,18),24
INITIAL     MH$DSTNR(2,1),38
INITIAL     MH$DSTNR(2,2-3),39
INITIAL     MH$DSTNR(2,4),38
INITIAL     MH$DSTNR(2,5),36
INITIAL     MH$DSTNR(2,6),38
INITIAL     MH$DSTNR(2,7),21
INITIAL     MH$DSTNR(2,8),62
INITIAL     MH$DSTNR(2,9),55
INITIAL     MH$DSTNR(2,10),38
INITIAL     MH$DSTNR(2,11),45
INITIAL     MH$DSTNR(2,12),31
INITIAL     MH$DSTNR(2,13),35
INITIAL     MH$DSTNR(2,14),38
INITIAL     MH$DSTNR(2,15),42
INITIAL     MH$DSTNR(2,16),28
INITIAL     MH$DSTNR(2,17),45
INITIAL     MH$DSTNR(2,18),35
INITIAL     MH$DSTNR(3,1),26
INITIAL     MH$DSTNR(3,2),38
INITIAL     MH$DSTNR(3,3),46
INITIAL     MH$DSTNR(3,4),26
INITIAL     MH$DSTNR(3,5),43
```

Same as DSTN matrix, except distances are for a non-radar environment.

(continued)

```
INITIAL    MH$DSTNR(3,6),28
INITIAL    MH$DSTNR(3,7),14
INITIAL    MH$DSTNR(3,8),49
INITIAL    MH$DSTNR(3,9),45
INITIAL    MH$DSTNR(3,10),27
INITIAL    MH$DSTNR(3,11),55
INITIAL    MH$DSTNR(3,12),41
INITIAL    MH$DSTNR(3,13),27
INITIAL    MH$DSTNR(3,14),48
INITIAL    MH$DSTNR(3,15),52
INITIAL    MH$DSTNR(3,16),38
INITIAL    MH$DSTNR(3,17),55
INITIAL    MH$DSTNR(3,18),24
INITIAL    MH$DSTNR(4,1),19
INITIAL    MH$DSTNR(4,2),18
INITIAL    MH$DSTNR(4,3),29
INITIAL    MH$DSTNR(4,4),25
INITIAL    MH$DSTNR(4,5),39
INITIAL    MH$DSTNR(4,6),45
INITIAL    MH$DSTNR(4,7),35
INITIAL    MH$DSTNR(4,8),66
INITIAL    MH$DSTNR(4,9),62
INITIAL    MH$DSTNR(4,10),51
INITIAL    MH$DSTNR(4,11),34
INITIAL    MH$DSTNR(4,12),21
INITIAL    MH$DSTNR(4,13),48
INITIAL    MH$DSTNR(4,14),28
INITIAL    MH$DSTNR(4,15),31
INITIAL    MH$DSTNR(4,16),17
INITIAL    MH$DSTNR(4,17),34
INITIAL    MH$DSTNR(4,18),45
INITIAL    MH$DSTNR(5,1),27
INITIAL    MH$DSTNR(5,2),38
INITIAL    MH$DSTNR(5,3),29
INITIAL    MH$DSTNR(5,4),44
INITIAL    MH$DSTNR(5,5),27
INITIAL    MH$DSTNR(5,6),15
INITIAL    MH$DSTNR(5,7),24
INITIAL    MH$DSTNR(5,8),38
INITIAL    MH$DSTNR(5,9),48
INITIAL    MH$DSTNR(5,10),28
INITIAL    MH$DSTNR(5,11),42
INITIAL    MH$DSTNR(5,12),55
INITIAL    MH$DSTNR(5,13),38
INITIAL    MH$DSTNR(5,14),28
INITIAL    MH$DSTNR(5,15),58
INITIAL    MH$DSTNR(5,16),38
INITIAL    MH$DSTNR(5,17),52
INITIAL    MH$DSTNR(5,18),17
INITIAL    MH$CATWT(1-4,1-7),1000
INITIAL    MH$CATWT(1,1-2),0
INITIAL    MH$CATWT(1,3),787
INITIAL    MH$CATWT(1,5),0
INITIAL    MH$CATWT(1,6),787
INITIAL    MH$CATWT(2,1),0
INITIAL    MH$CATWT(2,5),0
INITIAL    MH$CATWT(4,1),300
INITIAL    MH$CATWT(4,2),500
INITIAL    MH$CATWT(4,5),500
```

Same as DSTN matrix, except distances are for a non-radar environment.

```
INITIAL    MH$VFRPT(1-5,1),782
INITIAL    MH$VFRPT(1-5,2),897
INITIAL    MH$VFRPT(1-5,3),996
INITIAL    MH$VFRPT(6,1),30
INITIAL    MH$VFRPT(14,1),2
INITIAL    MH$VFRPT(6,2),111
INITIAL    MH$VFRPT(7,2),2
INITIAL    MH$VFRPT(10,2),190
INITIAL    MH$VFRPT(14,2),11
INITIAL    MH$VFRPT(18,2),235
INITIAL    MH$VFRPT(6,3),947
INITIAL    MH$VFRPT(7,3),816
INITIAL    MH$VFRPT(8,3),1000
INITIAL    MH$VFRPT(9,3),38
INITIAL    MH$VFRPT(10-13,3),1000
INITIAL    MH$VFRPT(14,3),869
INITIAL    MH$VFRPT(15,3),1000
INITIAL    MH$VFRPT(16,3),174
INITIAL    MH$VFRPT(17-18,3),1000
INITIAL    MH$IFRPT(1-5,1),782
INITIAL    MH$IFRPT(1-5,2),897
INITIAL    MH$IFRPT(1-5,3),996
INITIAL    MH$IFRPT(6,1),30
INITIAL    MH$IFRPT(14,1),2
INITIAL    MH$IFRPT(6,2),111
INITIAL    MH$IFRPT(7,2),2
```

Initializes matrix used to determine from generated aircraft destinations the aircraft type based on VFR and IFR conditions.

```
INITIAL    MH$IFRPT(10,2),190
```

(continued)

```
INITIAL    MH$IFRPT(14,2),11
INITIAL    MH$IFRPT(18,2),235
INITIAL    MH$IFRPT(6,3),947
INITIAL    MH$IFRPT(7,3),816
INITIAL    MH$IFRPT(8,3),1000
INITIAL    MH$IFRPT(9,3),38
INITIAL    MH$IFRPT(10-13,3),1000
INITIAL    MH$IFRPT(14,3),869
INITIAL    MH$IFRPT(15,3),1000
INITIAL    MH$IFRPT(16,3),174
```

Initializes matrix used to determine from generated aircraft destinations the aircraft type based on VFR and IFR conditions.

```
INITIAL    MH$IFRPT(17-18,3),1000
INITIAL    MH$IFRAC(1,1),297
INITIAL    MH$IFRAC(1,2),597
INITIAL    MH$IFRAC(1-7,3),847
INITIAL    MH$IFRAC(1-7,4),897
INITIAL    MH$IFRAC(1-7,5-8),996
INITIAL    MH$IFRAC(1-7,9-15),997
INITIAL    MH$IFRAC(1-7,16-17),1000
INITIAL    MH$IFRAC(2-7,1),299
INITIAL    MH$IFRAC(2-7,2),598
INITIAL    MH$IFRAC(8,1),260
INITIAL    MH$IFRAC(8,2),522
INITIAL    MH$IFRAC(8,3),740
INITIAL    MH$IFRAC(8,4),784
INITIAL    MH$IFRAC(8,5-7),871
INITIAL    MH$IFRAC(8,8),954
INITIAL    MH$IFRAC(8,9-13),955
INITIAL    MH$IFRAC(8,14-15),998
INITIAL    MH$IFRAC(8,16-17),1000
INITIAL    MH$IFRAC(9-18,1),251
INITIAL    MH$IFRAC(9-18,2),502
INITIAL    MH$IFRAC(9,3),711
INITIAL    MH$IFRAC(10-18,3),710
INITIAL    MH$IFRAC(9-18,4),752
INITIAL    MH$IFRAC(9-18,5),836
INITIAL    MH$IFRAC(9,6),929
INITIAL    MH$IFRAC(10-18,6),928
INITIAL    MH$IFRAC(9-18,7),946
INITIAL    MH$IFRAC(9-18,8),947
INITIAL    MH$IFRAC(9-18,9),948
INITIAL    MH$IFRAC(9,10),954
INITIAL    MH$IFRAC(10-18,10),954
INITIAL    MH$IFRAC(9-18,11-13),955
INITIAL    MH$IFRAC(9,11),954
INITIAL    MH$IFRAC(9-18,14),996
INITIAL    MH$IFRAC(9-18,15),997
INITIAL    MH$IFRAC(9-18,16),998
INITIAL    MH$IFRAC(9-18,17),999
INITIAL    MH$IFRAC(19-23,1),258
INITIAL    MH$IFRAC(19-23,2),516
INITIAL    MH$IFRAC(19-23,3),731
INITIAL    MH$IFRAC(19-23,4),774
INITIAL    MH$IFRAC(19-23,5),860
INITIAL    MH$IFRAC(19-23,6-8),955
INITIAL    MH$IFRAC(19-23,9-13),956
INITIAL    MH$IFRAC(19-24,14-15),998
INITIAL    MH$IFRAC(19-24,16-17),1000
INITIAL    MH$IFRAC(24,1),269
INITIAL    MH$IFRAC(24,2),538
INITIAL    MH$IFRAC(24,3),763
INITIAL    MH$IFRAC(24,4),807
INITIAL    MH$IFRAC(24,5),897
INITIAL    MH$IFRAC(24,6-8),997
INITIAL    MH$IFRAC(24,9-13),998
INITIAL    MH$IFRAC(1,18),3
INITIAL    MH$IFRAC(2,18),5
INITIAL    MH$IFRAC(3,18),5
INITIAL    MH$IFRAC(4,18),7
INITIAL    MH$IFRAC(5,18),9
INITIAL    MH$IFRAC(6,18),14
INITIAL    MH$IFRAC(7,18),20
INITIAL    MH$IFRAC(8,18),24
INITIAL    MH$IFRAC(9,18),33
INITIAL    MH$IFRAC(10,18),32
INITIAL    MH$IFRAC(11,18),30
INITIAL    MH$IFRAC(12,18),32
INITIAL    MH$IFRAC(13,18),37
INITIAL    MH$IFRAC(14,18),37
INITIAL    MH$IFRAC(15,18),31
INITIAL    MH$IFRAC(16,18),43
INITIAL    MH$IFRAC(17,18),48
INITIAL    MH$IFRAC(18,18),35
INITIAL    MH$IFRAC(19,18),43
INITIAL    MH$IFRAC(20,18),37
INITIAL    MH$IFRAC(21,18),27
INITIAL    MH$IFRAC(22,18),20
```

Initializes the number of aircraft to generate per hour in both IFR and VFR conditions and the aircraft destinations.

(continued)

```
INITIAL    MH$IFRAC(23,18),6
INITIAL    MH$IFRAC(24,18),10
INITIAL    MH$VFRAC(1,1),297
INITIAL    MH$VFRAC(1,2),597
INITIAL    MH$VFRAC(1-7,3),847
INITIAL    MH$VFRAC(1-7,4),897
INITIAL    MH$VFRAC(1-7,5-8),996
INITIAL    MH$VFRAC(1-7,9-15),997
INITIAL    MH$VFRAC(1-7,16-17),1000
INITIAL    MH$VFRAC(2-7,1),299
INITIAL    MH$VFRAC(2-7,2),598
INITIAL    MH$VFRAC(8,1),260
INITIAL    MH$VFRAC(8,2),522
INITIAL    MH$VFRAC(8,3),740
INITIAL    MH$VFRAC(8,4),784
INITIAL    MH$VFRAC(8,5-7),871
INITIAL    MH$VFRAC(8,8),954
INITIAL    MH$VFRAC(8,9-13),955
INITIAL    MH$VFRAC(8,14-15),998
INITIAL    MH$VFRAC(8,16-17),1000
INITIAL    MH$VFRAC(9-18,1),251
INITIAL    MH$VFRAC(9-18,2),502
INITIAL    MH$VFRAC(9,3),711
INITIAL    MH$VFRAC(10-18,3),710
INITIAL    MH$VFRAC(9-18,4),752
INITIAL    MH$VFRAC(9-18,5),836
INITIAL    MH$VFRAC(9,6),929
INITIAL    MH$VFRAC(10-18,6),928
INITIAL    MH$VFRAC(9-18,7),946
INITIAL    MH$VFRAC(9-18,8),947
INITIAL    MH$VFRAC(9-18,9),948
INITIAL    MH$VFRAC(9,10),954
INITIAL    MH$VFRAC(10-18,10),954
INITIAL    MH$VFRAC(9-18,11-13),955
INITIAL    MH$VFRAC(9,11),954
INITIAL    MH$VFRAC(9-18,14),996
INITIAL    MH$VFRAC(9-18,15),997
INITIAL    MH$VFRAC(9-18,16),998
INITIAL    MH$VFRAC(9-18,17),999
INITIAL    MH$VFRAC(19-23,1),258
INITIAL    MH$VFRAC(19-23,2),516
INITIAL    MH$VFRAC(19-23,3),731
INITIAL    MH$VFRAC(19-23,4),774
INITIAL    MH$VFRAC(19-23,5),860
INITIAL    MH$VFRAC(19-23,6-8),955
INITIAL    MH$VFRAC(19-23,9-13),956
INITIAL    MH$VFRAC(19-24,14-15),998
INITIAL    MH$VFRAC(19-24,16-17),1000
INITIAL    MH$VFRAC(24,1),269
INITIAL    MH$VFRAC(24,2),538
INITIAL    MH$VFRAC(24,3),763
INITIAL    MH$VFRAC(24,4),807
INITIAL    MH$VFRAC(24,5),897
INITIAL    MH$VFRAC(24,6-8),997
INITIAL    MH$VFRAC(24,9-13),998
INITIAL    MH$VFRAC(1,18),7
INITIAL    MH$VFRAC(2,18),6
INITIAL    MH$VFRAC(3,18),6
INITIAL    MH$VFRAC(4,18),8
INITIAL    MH$VFRAC(5,18),11
INITIAL    MH$VFRAC(6,18),17
INITIAL    MH$VFRAC(7,18),25
INITIAL    MH$VFRAC(8,18),30
INITIAL    MH$VFRAC(9,18),41
INITIAL    MH$VFRAC(10,18),40
INITIAL    MH$VFRAC(11,18),39
INITIAL    MH$VFRAC(12,18),40
INITIAL    MH$VFRAC(13,18),46
INITIAL    MH$VFRAC(14,18),46
INITIAL    MH$VFRAC(15,18),40
INITIAL    MH$VFRAC(16,18),53
INITIAL    MH$VFRAC(17,18),60
INITIAL    MH$VFRAC(18,18),43
INITIAL    MH$VFRAC(19,18),53
INITIAL    MH$VFRAC(20,18),46
INITIAL    MH$VFRAC(21,18),33
INITIAL    MH$VFRAC(22,18),26
INITIAL    MH$VFRAC(23,18),7
INITIAL    MH$VFRAC(24,18),12
```

Initializes the number of aircraft to generate per hour in both IFR and VFR conditions and the aircraft destinations.

```
INITIAL    MH$ARSEP(1-8,1),37
INITIAL    MH$ARSEP(1-4,2),39
INITIAL    MH$ARSEP(9-12,2),39
INITIAL    MH$ARSEP(1-2,3),40
INITIAL    MH$ARSEP(5-6,3),40
INITIAL    MH$ARSEP(9-10,3),40
INITIAL    MH$ARSEP(13,3),40
```

Initializes the separation matrix used to determine, for equipment outages, the separation between aircraft and the maximum number of aircraft under air control.

(continued)

```
INITIAL    MH$ARSEP(15,3),40
INITIAL    MH$ARSEP(1,4),38
INITIAL    MH$ARSEP(3,4),38
INITIAL    MH$ARSEP(5,4),38
INITIAL    MH$ARSEP(7,4),38
INITIAL    MH$ARSEP(9,4),38
INITIAL    MH$ARSEP(11,4),38
INITIAL    MH$ARSEP(13,4),38
INITIAL    MH$ARSEP(14,4),38
INITIAL    MH$ARSEP(1-10,5),3
INITIAL    MH$ARSEP(5-8,5),4
INITIAL    MH$ARSEP(11-14,5),5
INITIAL    MH$ARSEP(15,5),12
INITIAL    MH$ARSEP(16,5),12
INITIAL    MH$ARSEP(1-4,6),1
INITIAL    MH$ARSEP(9-10,6),1
INITIAL    MH$ARSEP(1-4,7),2
INITIAL    MH$ARSEP(5-8,7),1
INITIAL    MH$ARSEP(9-10,7),2
INITIAL    MH$ARSEP(1-4,8),3
INITIAL    MH$ARSEP(5-8,8),2
INITIAL    MH$ARSEP(9-10,8),3
INITIAL    MH$ARSEP(11-16,8),1      Initializes the separation matrix used to determine,
INITIAL    MH$ARSEP(1-4,10),1       for equipment outages, the separation between air-
INITIAL    MH$ARSEP(9-10,10),1      craft and the maximum number of aircraft under air
INITIAL    MH$ARSEP(1-12,11),16     control.
INITIAL    MH$ARSEP(1-2,11),20
INITIAL    MH$ARSEP(5-6,11),10
INITIAL    MH$ARSEP(7-8,11),12
INITIAL    MH$ARSEP(9-10,11),20
INITIAL    MH$ARSEP(13,11),10
INITIAL    MH$ARSEP(14,11),8
INITIAL    MH$ARSEP(15,11),10
INITIAL    MH$ARSEP(16,11),8
INITIAL    MH01(1,1),360
INITIAL    MH01(1,2),7
INITIAL    MH01(1,3),1
INITIAL    MH01(1,4-11),1000
INITIAL    MH01(1,12),2
INITIAL    MH01(1,13),3
INITIAL    MH01(2,2),96
INITIAL    MH01(2,3),58
INITIAL    MH01(2,4),61
INITIAL    MH01(2,5),7
INITIAL    MH01(2,6),576
INITIAL    MH01(2,7),448
INITIAL    MH01(2,8),839
INITIAL    MH01(2,9),777
INITIAL    MH01(2,10),1000
INITIAL    MH01(2,10),1000
INITIAL    MH01(2,11),990
INITIAL    MH01(2,12),4
INITIAL    MH01(2,13),5             Initializes weather matrix to determine wind direction
INITIAL    MH01(3,1),22             and velocity.  Also directs which ceiling and visibility
INITIAL    MH01(3,2),128            matrix to calculate ceiling and visibility.
INITIAL    MH01(3,3),85
INITIAL    MH01(3,4),152
INITIAL    MH01(3,5),76
INITIAL    MH01(3,6),704
INITIAL    MH01(3,7),510
INITIAL    MH01(3,8),891
INITIAL    MH01(3,9),753
INITIAL    MH01(3,10),996
INITIAL    MH01(3,11),995
INITIAL    MH01(3,12),6
INITIAL    MH01(3,13),7
INITIAL    MH01(4,1),45
INITIAL    MH01(4,2),163
INITIAL    MH01(4,3),118
INITIAL    MH01(4,4),113
INITIAL    MH01(4,5),29
INITIAL    MH01(4,6),510
INITIAL    MH01(4,7),324
INITIAL    MH01(4,8),755
INITIAL    MH01(4,9),639
INITIAL    MH01(4,10),981
INITIAL    MH01(4,11),979
INITIAL    MH01(4,12),8
INITIAL    MH01(4,13),9
INITIAL    MH01(5,1),67
INITIAL    MH01(5,2),198
INITIAL    MH01(5,3),169
INITIAL    MH01(5,4),82
INITIAL    MH01(5,5),41
INITIAL    MH01(5,6),494
INITIAL    MH01(5,5),441
```

(continued)

```
INITIAL    MH01(5,8),724
INITIAL    MH01(5,9),770
INITIAL    MH01(5,10),981
INITIAL    MH01(5,11),992
INITIAL    MH01(5,12),10
INITIAL    MH01(5,13),11
INITIAL    MH01(6,1),90
INITIAL    MH01(6,2),232
INITIAL    MH01(6,3),263
INITIAL    MH01(6,4),167
INITIAL    MH01(6,5),49
INITIAL    MH01(6,6),642
INITIAL    MH01(6,7),431
INITIAL    MH01(6,8),776
INITIAL    MH01(6,9),820
INITIAL    MH01(6,10),976
INITIAL    MH01(6,11),996
INITIAL    MH01(6,12),12
INITIAL    MH01(6,13),13
INITIAL    MH01(7,1),112
INITIAL    MH01(7,2),254
INITIAL    MH01(7,3),348
INITIAL    MH01(7,4),207
INITIAL    MH01(7,5),47
INITIAL    MH01(7,6),671
INITIAL    MH01(6,7),437
INITIAL    MH01(7,8),866
INITIAL    MH01(7,9),804
INITIAL    MH01(7,10),994
INITIAL    MH01(7,11),1000
INITIAL    MH01(7,12),14
INITIAL    MH01(7,13),15
INITIAL    MH01(8,1),135
INITIAL    MH01(8,2),272
INITIAL    MH01(8,3),398
INITIAL    MH01(8,4),237
INITIAL    MH01(8,5),66
INITIAL    MH01(8,6),777
INITIAL    MH01(8,7),680
INITIAL    MH01(8,8),935
INITIAL    MH01(8,9),962
INITIAL    MH01(8,10),993
INITIAL    MH01(8,11),995
INITIAL    MH01(8,12),16
INITIAL    MH01(8,13),17
INITIAL    MH01(9,1),157
INITIAL    MH01(9,2),296
INITIAL    MH01(9,3),425
INITIAL    MH01(9,4),153
INITIAL    MH01(9,5),101
INITIAL    MH01(9,6),736
INITIAL    MH01(9,7),641
INITIAL    MH01(9,8),939
INITIAL    MH01(9,9),924
INITIAL    MH01(9,10),1000
INITIAL    MH01(9,11),995
INITIAL    MH01(9,12),18
INITIAL    MH01(9,13),19
INITIAL    MH01(10,1),180
INITIAL    MH01(10,2),365
INITIAL    MH01(10,3),489
INITIAL    MH01(10,4),109
INITIAL    MH01(10,5),53
INITIAL    MH01(10,6),757
INITIAL    MH01(10,7),456
INITIAL    MH01(10,8),949
INITIAL    MH01(10,9),803
INITIAL    MH01(10,10),1000
INITIAL    MH01(10,11),985
INITIAL    MH01(10,12),20
INITIAL    MH01(10,13),21
INITIAL    MH01(11,1),202
INITIAL    MH01(11,2),424
INITIAL    MH01(11,3),550
INITIAL    MH01(11,4),58
INITIAL    MH01(11,5),20
INITIAL    MH01(11,6),569
INITIAL    MH01(11,7),211
INITIAL    MH01(11,8),845
INITIAL    MH01(11,9),602
INITIAL    MH01(11,10),1000
INITIAL    MH01(11,11),998
INITIAL    MH01(11,12),22
INITIAL    MH01(11,13),23
INITIAL    MH01(12,1),225
INITIAL    MH01(12,2),496
```

Initializes weather matrix to determine wind direction and velocity. Also directs which ceiling and visibility matrix to calculate ceiling and visibility.

(continued)

```
INITIAL    MH01(12,3),591
INITIAL    MH01(12,4),48
INITIAL    MH01(12,5),17
INITIAL    MH01(12,6),479
INITIAL    MH01(12,7),195
INITIAL    MH01(12,8),779
INITIAL    MH01(12,9),510
INITIAL    MH01(12,10),998
INITIAL    MH01(12,11),1000
INITIAL    MH01(12,12),24
INITIAL    MH01(12,13),25
INITIAL    MH01(13,1),247
INITIAL    MH01(13,2),616
INITIAL    MH01(13,3),663
INITIAL    MH01(13,4),19
INITIAL    MH01(13,5),15
INITIAL    MH01(13,6),439
INITIAL    MH01(13,7),302
INITIAL    MH01(13,8),827
INITIAL    MH01(13,9),645
INITIAL    MH01(13,10),999
INITIAL    MH01(13,11),992
INITIAL    MH01(13,12),26
INITIAL    MH01(13,13),27
INITIAL    MH01(14,1),270
INITIAL    MH01(14,2),776
INITIAL    MH01(14,3),777
INITIAL    MH01(14,4),69
INITIAL    MH01(14,5),14
INITIAL    MH01(14,6),312
INITIAL    MH01(14,7),211
INITIAL    MH01(14,8),651
INITIAL    MH01(14,9),498
INITIAL    MH01(14,10),990
INITIAL    MH01(14,11),966
INITIAL    MH01(14,12),28
INITIAL    MH01(14,13),29
INITIAL    MH01(15,1),292
INITIAL    MH01(15,2),836
INITIAL    MH01(15,3),874
INITIAL    MH01(15,4),33
INITIAL    MH01(15,5),101
INITIAL    MH01(15,6),295
INITIAL    MH01(15,7),184
INITIAL    MH01(15,8),649
INITIAL    MH01(15,9),439
INITIAL    MH01(15,10),974
INITIAL    MH01(15,11),977
INITIAL    MH01(15,12),30
INITIAL    MH01(15,13),31
INITIAL    MH01(16,1),315
INITIAL    MH01(16,2),937
INITIAL    MH01(16,3),958
INITIAL    MH01(16,4),26
INITIAL    MH01(16,5),20
INITIAL    MH01(16,6),396
INITIAL    MH01(16,7),225
INITIAL    MH01(16,8),734
INITIAL    MH01(16,9),554
INITIAL    MH01(16,10),996
INITIAL    MH01(16,11),993
INITIAL    MH01(16,12),32
INITIAL    MH01(16,13),33
INITIAL    MH01(17,1),337
INITIAL    MH01(17,2),1000
INITIAL    MH01(17,3),1000
INITIAL    MH01(17,4),30
INITIAL    MH01(17,5),13
INITIAL    MH01(17,6),413
INITIAL    MH01(17,7),835
INITIAL    MH01(17,8),835
INITIAL    MH01(17,9),658
INITIAL    MH01(17,10),1000
INITIAL    MH01(17,11),1000
INITIAL    MH01(17,12),34
INITIAL    MH01(17,13),35
```

Initializes weather matrix to determine wind direction and velocity. Also directs which ceiling and visibility matrix to calculate ceiling and visibility.

```
INITIAL    MH2(1,1-2),857
INITIAL    MH2(2,1-2),877
INITIAL    MH2(3,1-2),918
INITIAL    MH2(4,1-2),938
INITIAL    MH2(5-6,1-2),979
INITIAL    MH3(1,1-2),24
INITIAL    MH3(2,1-2),48
INITIAL    MH3(3,1-2),48
INITIAL    MH3(4,1-2),72
INITIAL    MH3(5,1-2),119
```

Initializes the ceiling and visibility matrixes for various wind directions and velocities.

(continued)

```
INITIAL    MH3(6,1-2),143
INITIAL    MH3(6,5-10),1000
INITIAL    MH3(4-5,7-10),1000
INITIAL    MH3(1-3,9-10),500
INITIAL    MH3(1-6,13-14),1000
INITIAL    MH4(1,1),825
INITIAL    MH4(1,2),733
INITIAL    MH4(1,3),798
INITIAL    MH4(1,4),841
INITIAL    MH4(1,5),762
INITIAL    MH4(1,6),752
INITIAL    MH4(1,7),714
INITIAL    MH4(1,8),640
INITIAL    MH4(1-6,9),1000
INITIAL    MH4(2,1),850
INITIAL    MH4(2,2),800
INITIAL    MH4(2,3),857
INITIAL    MH4(2,4),911
INITIAL    MH4(2,5),878
INITIAL    MH4(2,6),883
INITIAL    MH4(2,7),876
INITIAL    MH4(2,8),820
INITIAL    MH4(2-3,10),750
INITIAL    MH4(3,1),850
INITIAL    MH4(3,2),833
INITIAL    MH4(3,3),881
INITIAL    MH4(3,4),943
INITIAL    MH4(3,5),901
INITIAL    MH4(3,6),905
INITIAL    MH4(3,7),933
INITIAL    MH4(3,8),910
INITIAL    MH4(4,1),850
INITIAL    MH4(4,2),866
INITIAL    MH4(4,3),914
INITIAL    MH4(4,4),956
INITIAL    MH4(4,5),948
INITIAL    MH4(4,6),956
INITIAL    MH4(4,7),962
INITIAL    MH4(4,8),944
INITIAL    MH4(4-6,10),1000
INITIAL    MH4(5,1),875
INITIAL    MH4(5,2),900
INITIAL    MH4(5,3),950
INITIAL    MH4(5,4),981
INITIAL    MH4(5,5),977
INITIAL    MH4(5,6),992
INITIAL    MH4(5,7),991
INITIAL    MH4(5,8),989
INITIAL    MH4(6,1),950
INITIAL    MH4(6,2),967
INITIAL    MH4(6,3),977
INITIAL    MH4(6,4),981
INITIAL    MH4(6,5),994
INITIAL    MH4(6,6-7),1000
INITIAL    MH4(6,8),989
INITIAL    MH5(1,8),71
INITIAL    MH5(1,11),63
INITIAL    MH5(1,13),455
INITIAL    MH5(1,14),400
INITIAL    MH5(2,1),2
INITIAL    MH5(2,4),60
INITIAL    MH5(2,6),59
INITIAL    MH5(2,8),143
INITIAL    MH5(2,11),313
INITIAL    MH5(2,12),333
INITIAL    MH5(2,13),728
INITIAL    MH5(2,14),600
INITIAL    MH5(3,1),2
INITIAL    MH5(3,3),17
INITIAL    MH5(3,4),80
INITIAL    MH5(3,5),56
INITIAL    MH5(3,6),118
INITIAL    MH5(3,7),91
INITIAL    MH5(3,8),143
INITIAL    MH5(3,9),48
INITIAL    MH5(3,10),71
INITIAL    MH5(3,11),501
INITIAL    MH5(3,12),333
INITIAL    MH5(3,13),819
INITIAL    MH5(3,14),800
INITIAL    MH5(4,1),6
INITIAL    MH5(4,2),6
INITIAL    MH5(4,3),51
INITIAL    MH5(4,4),120
INITIAL    MH5(4,5),111
INITIAL    MH5(4,6),176
```

Initializes the ceiling and visibility matrixes for various wind directions and velocities.

(continued)

AD-A058 984 ARINC RESEARCH CORP ANNAPOLIS MD F/G 1/5
USER DELAY COST MODEL AND FACILITIES MAINTENANCE COST MODEL FOR--ETC(U)
MAY 78 L B GREENE, J WITT DOT-TSC-1173-2
UNCLASSIFIED FAA-AAF-220-78-01-2 NL

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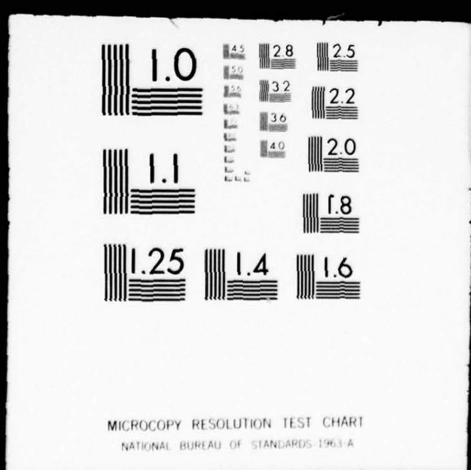

```
INITIAL    MH5(4,7),136
INITIAL    MH5(4,8),143
INITIAL    MH5(4,9),238
INITIAL    MH5(4,10),286
INITIAL    MH5(4,11),564
INITIAL    MH5(4,12),333
INITIAL    MH5(4,13),910
INITIAL    MH5(4-6,14),1000
INITIAL    MH5(5,1),6
INITIAL    MH5(5,2),13
INITIAL    MH5(5,3),85
INITIAL    MH5(5,4),200
INITIAL    MH5(5,5),222
INITIAL    MH5(5,6),294
INITIAL    MH5(5,7),227
INITIAL    MH5(5,8),214
INITIAL    MH5(5,9),381
INITIAL    MH5(5,10),500
INITIAL    MH5(5,11),814
INITIAL    MH5(5,12),667
INITIAL    MH5(5,13),910
INITIAL    MH5(6,1),12
INITIAL    MH5(6,2),16
INITIAL    MH5(6,3),171
INITIAL    MH5(6,4),260
INITIAL    MH5(6,5),389
INITIAL    MH5(6,6),412
INITIAL    MH5(6,7),485
INITIAL    MH5(6,8),429
INITIAL    MH5(6,9),810
INITIAL    MH5(6,10),500
INITIAL    MH5(6,11),877
INITIAL    MH5(6,12-13),1000
INITIAL    MH06(1-2,1),771
INITIAL    MH06(1,2),867
INITIAL    MH06(1,3),638
INITIAL    MH06(1,4),744
INITIAL    MH06(1,5),628
INITIAL    MH06(1,6),553
INITIAL    MH06(1,7),625
INITIAL    MH06(1,8),813
INITIAL    MH06(1-6,9-10),1000
INITIAL    MH06(2-3,2),933
INITIAL    MH06(2,3),732
INITIAL    MH06(2,4),849
INITIAL    MH06(2,5),857
INITIAL    MH06(2,6),766
INITIAL    MH06(2,7),750
INITIAL    MH06(2,8),983
INITIAL    MH06(3-4,1),800
INITIAL    MH06(3,3),764
INITIAL    MH06(3,4),860
INITIAL    MH06(3,5),884
INITIAL    MH06(3,6),809
INITIAL    MH06(3,7),72
INITIAL    MH06(3,8),938
INITIAL    MH06(4-6,2),1000
INITIAL    MH06(4,3),795
INITIAL    MH06(4,4),884
INITIAL    MH06(4,5),907
INITIAL    MH06(4,6),894
INITIAL    MH06(4,7),875
INITIAL    MH06(4,8),979
INITIAL    MH06(5,1),829
INITIAL    MH06(5,3),874
INITIAL    MH06(5,4),953
INITIAL    MH06(5,5),977
INITIAL    MH06(5,6),979
INITIAL    MH06(5,7),958
INITIAL    MH06(5-6,8),1000
INITIAL    MH06(6,1),914
INITIAL    MH06(6,3),939
INITIAL    MH06(6,4),977
INITIAL    MH06(6,5-7),1000
INITIAL    MH07(1,8),250
INITIAL    MH07(1,11),231
INITIAL    MH07(1,13),545
INITIAL    MH07(1,14),500
INITIAL    MH07(2-5,2),7
INITIAL    MH07(2,8),375
INITIAL    MH07(2,11),385
INITIAL    MH07(2,12),333
INITIAL    MH07(2,13),818
INITIAL    MH07(2-6,14),1000
INITIAL    MH07(3-5,6),167
INITIAL    MH07(3-4,8),500
```

Initializes the ceiling and visibility matrixes for various wind directions and velocities.

(continued)

```
INITIAL    MH07(3-4,9),63
INITIAL    MH07(3-4,11),462
INITIAL    MH07(3,12),667
INITIAL    MH07(3,13),818
INITIAL    MH07(4-5,10),273
INITIAL    MH07(4-6,12),1000
INITIAL    MH07(4-5,13),909
INITIAL    MH07(5,1),13
INITIAL    MH07(5,3),40
INITIAL    MH07(5,4),37
INITIAL    MH07(5,5),125
INITIAL    MH07(5,8),625
INITIAL    MH07(5,9),188
INITIAL    MH07(5,11),846
INITIAL    MH07(6,1),20
INITIAL    MH07(6,2),14
INITIAL    MH07(6,3),120
INITIAL    MH07(6,4),74
INITIAL    MH07(6,5-6),500
INITIAL    MH07(6,8),750
INITIAL    MH07(6,9),688
INITIAL    MH07(6,10),909
INITIAL    MH07(6,11-13),1000
INITIAL    MH08(1,1),793
INITIAL    MH08(1-4,2),857
INITIAL    MH08(1,3),549
INITIAL    MH08(1,4),629
INITIAL    MH08(1,5),492
INITIAL    MH08(1,6),547
INITIAL    MH08(1,7),586
INITIAL    MH08(1,8),593
INITIAL    MH08(1,9-10),200
INITIAL    MH08(2-3,1),862
INITIAL    MH08(2,3),637
INITIAL    MH08(2,4),743
INITIAL    MH08(2,5),651
INITIAL    MH08(2,6),693
INITIAL    MH08(2,7),776
INITIAL    MH08(2,8),765
INITIAL    MH08(2,9-10),800
INITIAL    MH08(3,3),725
INITIAL    MH08(3,4),757
INITIAL    MH08(3,5),762
INITIAL    MH08(3,6),747
INITIAL    MH08(3,7),810
INITIAL    MH08(3,8),852
INITIAL    MH08(3-5,9),800
INITIAL    MH08(3-6,10),1000
INITIAL    MH08(4,1),897
INITIAL    MH08(4,3),775
INITIAL    MH08(4,4),814
INITIAL    MH08(4,5),794
INITIAL    MH08(4,6),800
INITIAL    MH08(4,7),879
INITIAL    MH08(4,8),963
INITIAL    MH08(5-6,1),931
INITIAL    MH08(5-6,2),1000
INITIAL    MH08(5,3),804
INITIAL    MH08(5,4),857
INITIAL    MH08(5,5),873
INITIAL    MH08(5,6),893
INITIAL    MH08(5,7),914
INITIAL    MH08(5,8),975
INITIAL    MH08(6,3),902
INITIAL    MH08(6,4),943
INITIAL    MH08(6,5),1000
INITIAL    MH08(6,6),960
INITIAL    MH08(6,7),966
INITIAL    MH08(6,8-9),1000
INITIAL    MH09(1-4,2),7
INITIAL    MH09(1-5,5),56
INITIAL    MH09(1-5,9),91
INITIAL    MH09(1,11),182
INITIAL    MH09(1,13),357
INITIAL    MH09(1,14),714
INITIAL    MH09(2-5,3),57
INITIAL    MH09(2-3,8),59
INITIAL    MH09(2,11),273
INITIAL    MH09(2,12),154
INITIAL    MH09(2,13),643
INITIAL    MH09(2-5,14),857
INITIAL    MH09(3-5,1),7
INITIAL    MH09(3,10),83
INITIAL    MH09(3,11),409
INITIAL    MH09(3,12),385
INITIAL    MH09(3,13),714
```

Initializes the ceiling and visibility matrixes for various wind directions and velocities.

(continued)

```
INITIAL    MH09(4,4),54
INITIAL    MH09(4,6),83
INITIAL    MH09(4,7),167
INITIAL    MH09(4,8),176
INITIAL    MH09(4,10),167
INITIAL    MH09(4,11),500
INITIAL    MH09(4,12),538
INITIAL    MH09(4-6,13),929
INITIAL    MH09(5,2),29
INITIAL    MH09(5,4),81
INITIAL    MH09(5,6-7),250
INITIAL    MH09(5,8),294
INITIAL    MH09(5,10),417
INITIAL    MH09(5,11),545
INITIAL    MH09(5,12),769
INITIAL    MH09(6,1),21
INITIAL    MH09(6,2),36
INITIAL    MH09(6,3),200
INITIAL    MH09(6,4),270
INITIAL    MH09(6,5),222
INITIAL    MH09(6,6),583
INITIAL    MH09(6,7),333
INITIAL    MH09(6,8),647
INITIAL    MH09(6,9),455
INITIAL    MH09(6,10),750
INITIAL    MH09(6,11),773
INITIAL    MH09(6,12),846
INITIAL    MH09(6,14),1000
INITIAL    MH10(1,1),762
INITIAL    MH10(1-2,2),800
INITIAL    MH10(1,3),575
INITIAL    MH10(1,4),764
INITIAL    MH10(1,5),644
INITIAL    MH10(1,6),844
INITIAL    MH10(1,7),576
INITIAL    MH10(1,8),695
INITIAL    MH10(1,9),200
INITIAL    MH10(1,10),333
INITIAL    MH10(2,1),857
INITIAL    MH10(2,2),613
INITIAL    MH10(2,4),831
INITIAL    MH10(2,5),763
INITIAL    MH10(2,6),877
INITIAL    MH10(2,7),833
INITIAL    MH10(2,8),829
INITIAL    MH10(2,9),800
INITIAL    MH10(2,10),667
INITIAL    MH10(3-5,1),905
INITIAL    MH10(3-5,2),933
INITIAL    MH10(3,3),689
INITIAL    MH10(3,4),872
INITIAL    MH10(3,5),780
INITIAL    MH10(3,6),902
INITIAL    MH10(3,7),879
INITIAL    MH10(3,8),878
INITIAL    MH10(3-6,9-10),1000
INITIAL    MH10(4,3),755
INITIAL    MH10(4,4),905
INITIAL    MH10(4,5),831
INITIAL    MH10(4,6),918
INITIAL    MH10(4,7),924
INITIAL    MH10(4,8),951
INITIAL    MH10(5,3),783
INITIAL    MH10(5,4),939
INITIAL    MH10(5,5),898
INITIAL    MH10(5,6),959
INITIAL    MH10(5,7),955
INITIAL    MH10(5,8),988
INITIAL    MH10(6,1),952
INITIAL    MH10(6,2),1000
INITIAL    MH10(6,3),906
INITIAL    MH10(6,4),986
INITIAL    MH10(6,5),949
INITIAL    MH10(6,6),984
INITIAL    MH10(6,7),985
INITIAL    MH10(6,8),1000
INITIAL    MH11(2-3,3),30
INITIAL    MH11(3-5,4),115
INITIAL    MH11(4-5,8),77
INITIAL    MH11(2-4,9),111
INITIAL    MH11(2-3,13),733
INITIAL    MH11(4-6,13),1000
INITIAL    MH11(1,2),3
INITIAL    MH11(1,7),77
INITIAL    MH11(1,10),154
INITIAL    MH11(1,11),105
```

Initializes the ceiling and visibility matrixes for various wind directions and velocities.

(continued)

```
INITIAL     MH11(1,12),83
INITIAL     MH11(1,13),667
INITIAL     MH11(2,2),10
INITIAL     MH11(2,4),77
INITIAL     MH11(2,7),154
INITIAL     MH11(2,10),308
INITIAL     MH11(2,11),263
INITIAL     MH11(2,12),250
INITIAL     MH11(3,2),17
INITIAL     MH11(3,7),231
INITIAL     MH11(3,10),385
INITIAL     MH11(3,11),526
INITIAL     MH11(3,12),417
INITIAL     MH11(4,2),24
INITIAL     MH11(4,3),61
INITIAL     MH11(4,6),63
INITIAL     MH11(4,7),308
INITIAL     MH11(4,10),538
INITIAL     MH11(4,11),632
INITIAL     MH11(4,12),500
INITIAL     MH11(5,1),19
INITIAL     MH11(5,2),31
INITIAL     MH11(5,3),182
INITIAL     MH11(5,6),125
INITIAL     MH11(5,7),385
INITIAL     MH11(5,9),444
INITIAL     MH11(5,10),769
INITIAL     MH11(5,11),789
INITIAL     MH11(5,12),750
INITIAL     MH11(6,1),39
INITIAL     MH11(6,2),49
INITIAL     MH11(6,3),303
INITIAL     MH11(6,4),221
INITIAL     MH11(6,5),71
INITIAL     MH11(6,6),500
INITIAL     MH11(6,7),462
INITIAL     MH11(6,8),692
INITIAL     MH11(6,9),667
INITIAL     MH11(6,10),846
INITIAL     MH11(6,11),947
INITIAL     MH11(6,12),833
INITIAL     MH12(3-4,1),854
INITIAL     MH12(3-4,2),882
INITIAL     MH12(2-3,4),916
INITIAL     MH12(4-5,6),959
INITIAL     MH12(5-6,7-10),1000
INITIAL     MH12(1-4,9),1000
INITIAL     MH12(1-3,10),333
INITIAL     MH12(1,1),756
INITIAL     MH12(1,2),676
INITIAL     MH12(1,3),650
INITIAL     MH12(1,4),885
INITIAL     MH12(1,5),394
INITIAL     MH12(1,6),891
INITIAL     MH12(1,7),531
INITIAL     MH12(1,8),826
INITIAL     MH12(2,1),829
INITIAL     MH12(2,2),824
INITIAL     MH12(2,3),744
INITIAL     MH12(2,5),606
INITIAL     MH12(2,6),925
INITIAL     MH12(2,7),796
INITIAL     MH12(2,8),926
INITIAL     MH12(2,9),167
INITIAL     MH12(3,3),786
INITIAL     MH12(3,5),667
INITIAL     MH12(3,6),944
INITIAL     MH12(3,7),837
INITIAL     MH12(3,8),942
INITIAL     MH12(4,3),829
INITIAL     MH12(4,4),939
INITIAL     MH12(4,5),758
INITIAL     MH12(4,7),918
INITIAL     MH12(4,8),975
INITIAL     MH12(4,10),667
INITIAL     MH12(5,1),878
INITIAL     MH12(5,2),941
INITIAL     MH12(5,3),880
INITIAL     MH12(5,4),943
INITIAL     MH12(5,5),788
INITIAL     MH12(6,1),976
INITIAL     MH12(6,2),971
INITIAL     MH12(6,3),949
INITIAL     MH12(6,4),966
INITIAL     MH12(6,5),909
INITIAL     MH12(6,6),993
```

Initializes the ceiling and visibility matrixes for various wind directions and velocities.

(continued)

```
INITIAL    MH13(2-3,2),2
INITIAL    MH13(2-4,3),57
INITIAL    MH13(2-3,4),29
INITIAL    MH13(2-4,5),133
INITIAL    MH13(2-3,8),133
INITIAL    MH13(2-3,9),250
INITIAL    MH13(4-5,9),333
INITIAL    MH13(3-4,10),286
INITIAL    MH13(2-3,13),600
INITIAL    MH13(2-3,13),900
INITIAL    MH13(2-3,14),750
INITIAL    MH13(4-5,14),833
INITIAL    MH13(1,5),67
INITIAL    MH13(1,11),438
INITIAL    MH13(1,12),188
INITIAL    MH13(1,13),400
INITIAL    MH13(1,14),583
INITIAL    MH13(2,1),7
INITIAL    MH13(2,10),143
INITIAL    MH13(2,11),688
INITIAL    MH13(2,12),563
INITIAL    MH13(3,1),14
INITIAL    MH13(3,11),750
INITIAL    MH13(3,12),688
INITIAL    MH13(4,1),27
INITIAL    MH13(4,2),5
INITIAL    MH13(4,4),59
INITIAL    MH13(4,8),267
INITIAL    MH13(4,11),813
INITIAL    MH13(4,12),813
INITIAL    MH13(5,1),34
INITIAL    MH13(5,2),13
INITIAL    MH13(5,3),143
INITIAL    MH13(5,4),118
INITIAL    MH13(5,5),333
INITIAL    MH13(5,6),222
INITIAL    MH13(5,7),83
INITIAL    MH13(5,8),400
INITIAL    MH13(5,10),429
INITIAL    MH13(5,11-12),875
INITIAL    MH13(6,1),55
INITIAL    MH13(6,2),37
INITIAL    MH13(6,3),314
INITIAL    MH13(6,4),324
INITIAL    MH13(6,5),667
INITIAL    MH13(6,6),778
INITIAL    MH13(6,7),333
INITIAL    MH13(6,8),800
INITIAL    MH13(6,9),582
INITIAL    MH13(6,10),714
INITIAL    MH13(6,11-12),938
INITIAL    MH13(6,13-14),1000
INITIAL    MH14(2-3,1),788
INITIAL    MH14(5-6,2),931
INITIAL    MH14(4-5,5),938
INITIAL    MH14(5-6,8-10),1000
INITIAL    MH14(1-4,9-10),1000
INITIAL    MH14(1,1),758
INITIAL    MH14(1,2),724
INITIAL    MH14(1,3),675
INITIAL    MH14(1,4),896
INITIAL    MH14(1,5),813
INITIAL    MH14(1,6),930
INITIAL    MH14(1,7),286
INITIAL    MH14(1,8),902
INITIAL    MH14(2,2),793
INITIAL    MH14(2,3),727
INITIAL    MH14(2,4),922
INITIAL    MH14(2,5),875
INITIAL    MH14(2,6),961
INITIAL    MH14(2,7),571
INITIAL    MH14(2,8),959
INITIAL    MH14(3,2),828
INITIAL    MH14(3,3),805
INITIAL    MH14(3,4),942
INITIAL    MH14(3,5),906
INITIAL    MH14(3,6),969
INITIAL    MH14(3,7),619
INITIAL    MH14(3,8),975
INITIAL    MH14(4,1),818
INITIAL    MH14(4,2),897
INITIAL    MH14(4,3),844
INITIAL    MH14(4,4),971
INITIAL    MH14(4,6),987
INITIAL    MH14(4,7),762
INITIAL    MH14(4,8),984
```

Initializes the ceiling and visibility matrixes for various wind directions and velocities.

(continued)

```
INITIAL    MH14(5,1),848
INITIAL    MH14(5,3),883
INITIAL    MH14(5,4),979
INITIAL    MH14(5,6),991
INITIAL    MH14(5,7),857
INITIAL    MH14(6,1),909
INITIAL    MH14(6,3),961
INITIAL    MH14(6,4),996
INITIAL    MH14(6,5),969
INITIAL    MH14(6,6),996
INITIAL    MH14(6,7),905
INITIAL    MH15(4-5,3),231
INITIAL    MH15(2-4,4),91
INITIAL    MH15(1-2,8),71
INITIAL    MH15(6,9-14),1000
INITIAL    MH15(2-4,10),167
INITIAL    MH15(5,11-14),1000
INITIAL    MH15(1,11-12),200
INITIAL    MH15(2,11-12),600
INITIAL    MH15(3,11-12),800
INITIAL    MH15(4,12-14),1000
INITIAL    MH15(1-3,13),1000
INITIAL    MH15(2-3,14),750
INITIAL    MH15(1,14),250
INITIAL    MH15(2,2),2
INITIAL    MH15(2,9),167
INITIAL    MH15(3,2),5
INITIAL    MH15(3,8),214
INITIAL    MH15(3,9),333
INITIAL    MH15(4,2),12
INITIAL    MH15(4,7),250
INITIAL    MH15(4,8),286
INITIAL    MH15(4,9),500
INITIAL    MH15(4,11),900
INITIAL    MH15(5,2),18
INITIAL    MH15(5,4),182
INITIAL    MH15(5,5),125
INITIAL    MH15(5,7),500
INITIAL    MH15(5,8),643
INITIAL    MH15(5,9),667
INITIAL    MH15(5,10),333
INITIAL    MH15(6,1),18
INITIAL    MH15(6,2),29
INITIAL    MH15(6,3),308
INITIAL    MH15(6,4),500
INITIAL    MH15(6,5),250
INITIAL    MH15(6,7),750
INITIAL    MH15(6,8),929
INITIAL    MH16(1-2,1),879
INITIAL    MH16(1-2),2),958
INITIAL    MH16(5-6,1-2),1000
INITIAL    MH16(3-4,2),1000
INITIAL    MH16(2-5,4),996
INITIAL    MH16(6,4-5),1000
INITIAL    MH16(3-5,5),1000
INITIAL    MH16(2-3,6),981
INITIAL    MH16(4-6,6),990
INITIAL    MH16(1-3,7),875
INITIAL    MH16(4-6,7-10),1000
INITIAL    MH16(4,10),500
INITIAL    MH16(1-3,9),1000
INITIAL    MH16(1,3),720
INITIAL    MH16(1,4),964
INITIAL    MH16(1,5),773
INITIAL    MH16(1,6),942
INITIAL    MH16(1,8),667
INITIAL    MH16(2,3),853
INITIAL    MH16(2,5),909
INITIAL    MH16(2,8),917
INITIAL    MH16(3,1),909
INITIAL    MH16(3,3),893
INITIAL    MH16(3,8),1000
INITIAL    MH16(4,1),970
INITIAL    MH16(4,3),907
INITIAL    MH16(5,3),933
INITIAL    MH16(6,3),973
INITIAL    MH17(1-3,1),9
INITIAL    MH17(3-5,2),6
INITIAL    MH17(4-6,5),667
INITIAL    MH17(5-6,7),250
INITIAL    MH17(1-5,9),333
INITIAL    MH17(1-3,11),333
INITIAL    MH17(4-6,11-14),1000
INITIAL    MH17(1-3,12-14),1000
INITIAL    MH17(1,5),167
INITIAL    MH17(2,5),333
```

Initializes the ceiling and visibility matrixes for various wind directions and velocities.

(continued)

```
INITIAL    MH17(3,5),500
INITIAL    MH17(4,1),18
INITIAL    MH17(4,4),71
INITIAL    MH17(5,1),27
INITIAL    MH17(5,4),143
INITIAL    MH17(6,1),106
INITIAL    MH17(6,2),35
INITIAL    MH17(6,3),143
INITIAL    MH17(6,4),214
INITIAL    MH17(6,6),500
INITIAL    MH17(6,8),500
INITIAL    MH17(6,9),1000
INITIAL    MH18(6,1-10),1000
INITIAL    MH18(6,2),989
INITIAL    MH18(1-5,2),1000
INITIAL    MH18(2-3,4),981
INITIAL    MH18(4-5,4),991
INITIAL    MH18(2-3,5),938
INITIAL    MH18(4-5,5),969
INITIAL    MH18(2-3,6),964
INITIAL    MH18(4-5,6),1000
INITIAL    MH18(2-5,7),900
INITIAL    MH18(3-5,8-10),1000
INITIAL    MH18(1-2,9-10),1000
INITIAL    MH18(1,3),817
INITIAL    MH18(1,4),935
INITIAL    MH18(1,5),781
INITIAL    MH18(1,6),893
INITIAL    MH18(1,7),800
INITIAL    MH18(1,8),643
INITIAL    MH18(2,1),750
INITIAL    MH18(2,3),946
INITIAL    MH18(2,8),925
INITIAL    MH18(3,1),857
INITIAL    MH18(3,3),957
INITIAL    MH18(4,1),893
INITIAL    MH18(4,3),968
INITIAL    MH18(5,1),929       Initializes the ceiling and visibility matrixes for
INITIAL    MH18(5,3),978       various wind directions and velocities.
INITIAL    MH19(4-5,2),11
INITIAL    MH19(1-2,3),56
INITIAL    MH19(3-5,3),111
INITIAL    MH19(4-5,7),333
INITIAL    MH19(5-6,8-14),1000
INITIAL    MH19(1-4,10),1000
INITIAL    MH19(1-4,12-14),1000
INITIAL    MH19(2,11),400
INITIAL    MH19(3,2),6
INITIAL    MH19(3,11),600
INITIAL    MH19(4,4),385
INITIAL    MH19(4,8),667
INITIAL    MH19(4,11),800
INITIAL    MH19(5,4),692
INITIAL    MH19(6,1),1000
INITIAL    MH19(6,2),28
INITIAL    MH19(6,3),278
INITIAL    MH19(6,4),1000
INITIAL    MH19(6,5),250
INITIAL    MH19(6,7),667
INITIAL    MH20(6,1-10),1000
INITIAL    MH20(5-6,4),995
INITIAL    MH20(3-5,2),1000
INITIAL    MH20(5,5-10),1000
INITIAL    MH20(2-3,6),981
INITIAL    MH20(1-4,7-10),1000
INITIAL    MH20(1,8),965
INITIAL    MH20(1,1),800
INITIAL    MH20(1,2),828
INITIAL    MH20(1,3),987
INITIAL    MH20(1,4),947
INITIAL    MH20(1,5),825
INITIAL    MH20(1,6),957
INITIAL    MH20(2,1),891
INITIAL    MH20(2,2),862
INITIAL    MH20(2,3),948
INITIAL    MH20(2,4),979
INITIAL    MH20(2,5),918
INITIAL    MH20(3,1),927
INITIAL    MH20(3,3),960
INITIAL    MH20(3,4),984
INITIAL    MH20(3,5),959
INITIAL    MH20(4,1),945
INITIAL    MH20(4,3),979
INITIAL    MH20(4,4),989
INITIAL    MH20(4,5),990
INITIAL    MH20(4,6),994
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(continued)

```
INITIAL     MH20(5,1),964
INITIAL     MH20(5,3),988
INITIAL     MH21(4-5,8),667
INITIAL     MH21(4-5,10-11),500
INITIAL     MH21(1-6,12-14),1000
INITIAL     MH21(2,1),2
INITIAL     MH21(2,11),167
INITIAL     MH21(3,1),5
INITIAL     MH21(3,8),333
INITIAL     MH21(3,11),333
INITIAL     MH21(4,1),7
INITIAL     MH21(5,1),11
INITIAL     MH21(5,3),29
INITIAL     MH21(5,4),727
INITIAL     MH21(5,9),200
INITIAL     MH21(6,1),20
INITIAL     MH21(6,2),11
INITIAL     MH21(6,3),88
INITIAL     MH21(6,4),909
INITIAL     MH21(6,5),100
INITIAL     MH21(6,6),600
INITIAL     MH21(6,7),500
INITIAL     MH21(6,8),1000
INITIAL     MH21(6,9),600
INITIAL     MH21(6,10),1000
INITIAL     MH21(6,12),667
INITIAL     MH22(1-5,1),960
INITIAL     MH22(6,1-2),1000
INITIAL     MH22(2-5,2),1000
INITIAL     MH22(6,4-5),1000
INITIAL     MH22(4-5,4),1000
INITIAL     MH22(4-6,6-10),1000
INITIAL     MH22(1-3,9-10),1000
INITIAL     MH22(1,2),889
INITIAL     MH22(1,3),891
INITIAL     MH22(1,4),940
INITIAL     MH22(1,5),866
INITIAL     MH22(1,6),959
INITIAL     MH22(1,7),955
INITIAL     MH22(1,8),971
INITIAL     MH22(2,3),950
INITIAL     MH22(2,4),952
INITIAL     MH22(2,5),975
INITIAL     MH22(2,6),994
INITIAL     MH22(2,7),985
INITIAL     MH22(2,8),989
INITIAL     MH22(3,3),968
INITIAL     MH22(3,4),976
INITIAL     MH22(3,5),983
INITIAL     MH22(3,6),1000
INITIAL     MH22(3,7),985
INITIAL     MH22(3,8),1000
INITIAL     MH22(4,3),982
INITIAL     MH22(4,5),983
INITIAL     MH22(5,3),991
INITIAL     MH22(5,5),992
INITIAL     MH22(6,3),995
INITIAL     MH23(2-5,1),3
INITIAL     MH23(1-6,10-14),1000
INITIAL     MH23(1-5,11),333
INITIAL     MH23(1-3,13),0
INITIAL     MH23(5,3),71
INITIAL     MH23(5,5),200
INITIAL     MH23(5,9),333
INITIAL     MH23(6,1),5
INITIAL     MH23(6,2),7
INITIAL     MH23(6,3),107
INITIAL     MH23(6,4),1000
INITIAL     MH23(6,5),400
INITIAL     MH23(6,6),200
INITIAL     MH23(6,7),250
INITIAL     MH23(6,9),667
INITIAL     MH24(1-6,1-2),1000
INITIAL     MH24(2-6,4),1000
INITIAL     MH24(4-6,5),994
INITIAL     MH24(2-3,6),989
INITIAL     MH24(4-6,6),1000
INITIAL     MH24(3-4,7),991
INITIAL     MH24(5-6,7),1000
INITIAL     MH24(1-6,8-10),1000
INITIAL     MH24(1-2,8),986
INITIAL     MH24(1,3),930
INITIAL     MH24(1,4),981
INITIAL     MH24(1,5),930
INITIAL     MH24(1,6),958
INITIAL     MH24(1,7),965
```

Initializes the ceiling and visibility matrixes for various wind directions and velocities.

(continued)

```
INITIAL    MH24(2,3),965
INITIAL    MH24(2,5),975
INITIAL    MH24(2,7),983
INITIAL    MH24(3,3),974
INITIAL    MH24(3,5),981
INITIAL    MH24(4,3),982
INITIAL    MH24(5,3),987
INITIAL    MH24(6,3),991
INITIAL    MH25(1-5,1),2
INITIAL    MH25(5-6,5),250
INITIAL    MH25(1-6,6-14),1000
INITIAL    MH25(1-4,7),0
INITIAL    MH25(1-4,9),0
INITIAL    MH25(1,11),667
INITIAL    MH25(6,1),14
INITIAL    MH25(6,3),118
INITIAL    MH25(6,4),167
INITIAL    MH26(1-6,1),944
INITIAL    MH26(1-6,2),1000
INITIAL    MH26(5-6,3),995
INITIAL    MH26(3-4,4),987
INITIAL    MH26(5-6,4),993
INITIAL    MH26(6,5-10),1000
INITIAL    MH26(2-5,6-10),1000
INITIAL    MH26(2,7),993
INITIAL    MH26(1-3,8),995
INITIAL    MH26(1,9-10),1000
INITIAL    MH26(1,3),935
INITIAL    MH26(1,4),947
INITIAL    MH26(1,5),953
INITIAL    MH26(1,6),967
INITIAL    MH26(1,7),980
INITIAL    MH26(2,3),973
INITIAL    MH26(2,4),980
INITIAL    MH26(2,5),974
INITIAL    MH26(3,3),976
INITIAL    MH26(3,5),985
INITIAL    MH26(4,3),984
INITIAL    MH26(4,5),988
INITIAL    MH26(5,5),997
INITIAL    MH27(3-5,2),2
INITIAL    MH27(3-4,3),43
INITIAL    MH27(5-6,5),500
INITIAL    MH27(4-5,7),286
INITIAL    MH27(2-6,8-14),1000
INITIAL    MH27(2-4,9),0
INITIAL    MH27(1,12),1000
INITIAL    MH27(5,1),1
INITIAL    MH27(5,3),130
INITIAL    MH27(6,1),5
INITIAL    MH27(6,2),8
INITIAL    MH27(6,3),174
INITIAL    MH27(6,4),182
INITIAL    MH27(6,7),857
INITIAL    MH28(4-6,1),1000
INITIAL    MH28(1-6,2),1000
INITIAL    MH28(2-3,3),985
INITIAL    MH28(5-6,3),995
INITIAL    MH28(2-4,4),994
INITIAL    MH28(5-6,4-10),1000
INITIAL    MH28(2-4,5-10),1000
INITIAL    MH28(1-3,6),996
INITIAL    MH28(2-3,8),997
INITIAL    MH28(1-2,10),996
INITIAL    MH28(4,3),990
INITIAL    MH28(3,1),946
INITIAL    MH28(2,1),973
INITIAL    MH28(1,1),892
INITIAL    MH28(1,3),964
INITIAL    MH28(1,4),982
INITIAL    MH28(1,5),989
INITIAL    MH28(1,7),997
INITIAL    MH28(1,8),995
INITIAL    MH28(1,9),875
INITIAL    MH29(4-5,3),91
INITIAL    MH29(5-6,4),333
INITIAL    MH29(5-6,5),1000
INITIAL    MH29(5-6,8),1000
INITIAL    MH29(1-6,11-14),1000
INITIAL    MH29(1,13),0
INITIAL    MH29(4,1),1
INITIAL    MH29(5,1),1
INITIAL    MH29(5,2),2
INITIAL    MH29(6,1),5
INITIAL    MH29(6,2),7
INITIAL    MH29(6,3),182
```

Initializes the ceiling and visibility matrixes for various wind directions and velocities.

(continued)

```
INITIAL   MH29(6,7),500
INITIAL   MH30(1-6,1-2),1000
INITIAL   MH30(1,1),626
INITIAL   MH30(1,2),963
INITIAL   MH30(1-2,4),968
INITIAL   MH30(2-3,5),986
INITIAL   MH30(5-6,6-10),1000
INITIAL   MH30(1-4,7-10),1000
INITIAL   MH30(1,7),996
INITIAL   MH30(1,8),995
INITIAL   MH30(1,3),953
INITIAL   MH30(1,5),976
INITIAL   MH30(1,6),967
INITIAL   MH30(2,3),967
INITIAL   MH30(2,6),978
INITIAL   MH30(3,3),972
INITIAL   MH30(3,4),976
INITIAL   MH30(3,6),983
INITIAL   MH30(4,3),981
INITIAL   MH30(4,4),984
INITIAL   MH30(4,5),990
INITIAL   MH30(4,6),989
INITIAL   MH30(5,3),991
INITIAL   MH30(5,4),992
INITIAL   MH30(5,5),993
INITIAL   MH30(6,3),1000
INITIAL   MH30(6,4),992
INITIAL   MH30(6,5),997
INITIAL   MH31(3-5,2),1
INITIAL   MH31(5-6,3),222
INITIAL   MH31(6,4-5),500
INITIAL   MH31(6,6-14),1000
INITIAL   MH31(5-6,10),667
INITIAL   MH31(1-5,12-14),1000
INITIAL   MH31(3-4,7),333
INITIAL   MH31(3-4,8),500
INITIAL   MH31(3-4,9-11),333
INITIAL   MH31(4,11),667
INITIAL   MH31(1-2,11),333
INITIAL   MH31(4,3),111
INITIAL   MH31(5,4),250
INITIAL   MH31(5,7),667
INITIAL   MH31(5,8),1000
INITIAL   MH31(5,9),667
INITIAL   MH31(5,11),1000
INITIAL   MH31(6,1),5
INITIAL   MH31(6,2),7
INITIAL   MH32(1-6,1),947
INITIAL   MH32(2-3,2),917
INITIAL   MH32(4-6,2),1000
INITIAL   MH32(5-6,4),992
INITIAL   MH32(6,5-10),1000
INITIAL   MH32(4-5,5),1000
INITIAL   MH32(3-4,6),985
INITIAL   MH32(4-5,7),1000
INITIAL   MH32(3-4,8),996
INITIAL   MH32(1-5,9-10),1000
INITIAL   MH32(1,2),833
INITIAL   MH32(1,3),937
INITIAL   MH32(1,4),888
INITIAL   MH32(1,5),960
INITIAL   MH32(1,6),965
INITIAL   MH32(1,7),969
INITIAL   MH32(1,8),974
INITIAL   MH32(2,3),952
INITIAL   MH32(2,4),944
INITIAL   MH32(2,5),988
INITIAL   MH32(2,6),980
INITIAL   MH32(2,7),990
INITIAL   MH32(2,8),989
INITIAL   MH32(3,3),956
INITIAL   MH32(3,4),976
INITIAL   MH32(3,5),992
INITIAL   MH32(3,7),995
INITIAL   MH32(4,3),967
INITIAL   MH32(4,4),984
INITIAL   MH32(5,3),993
INITIAL   MH32(5,6),995
INITIAL   MH32(6,3),996
INITIAL   MH33(3-4,1),1
INITIAL   MH33(2-4,2),3
INITIAL   MH33(2-3,4),67
INITIAL   MH33(4-6,5),333
INITIAL   MH33(1-2,7),167
INITIAL   MH33(4-6,7),500
INITIAL   MH33(2-5,8),500
```

Initializes the ceiling and visibility matrixes for various wind directions and velocities.

(continued)

```
INITIAL     MH33(2-3,9),125
INITIAL     MH33(4-5,10),500
INITIAL     MH33(5-6,11-14),1000
INITIAL     MH33(5,12),0
INITIAL     MH33(1-4,13-14),1000
INITIAL     MH33(1-2,13),500
INITIAL     MH33(1,2),2
INITIAL     MH33(3,7),333
INITIAL     MH33(3,10),250
INITIAL     MH33(4,4),133
INITIAL     MH33(4,6),143
INITIAL     MH33(4,9),375
INITIAL     MH33(5,1),6
INITIAL     MH33(5,2),5
INITIAL     MH33(5,3),67
INITIAL     MH33(5,4),200
INITIAL     MH33(5,6),286
INITIAL     MH33(5,9),500
INITIAL     MH33(6,1),10
INITIAL     MH33(6,2),12
INITIAL     MH33(6,3),200
INITIAL     MH33(6,4),267
INITIAL     MH33(6,6),571
INITIAL     MH33(6,8),1000
INITIAL     MH33(6,9),750
INITIAL     MH33(6,10),750
INITIAL     MH34(1-5,1),786
INITIAL     MH34(6,1-3),1000
INITIAL     MH34(1-5,2),1000
INITIAL     MH34(5-6,4),989
INITIAL     MH34(6,5-10),1000
INITIAL     MH34(5,6-10),1000
INITIAL     MH34(4,7-10),1000
INITIAL     MH34(1-3,8-10),1000
INITIAL     MH34(1,3),903
INITIAL     MH34(1,4),828
INITIAL     MH34(1,5),918
INITIAL     MH34(1,6),879
INITIAL     MH34(1,7),934
INITIAL     MH34(1,8),962
INITIAL     MH34(2,3),938
INITIAL     MH34(2,4),892
INITIAL     MH34(2,5),964
INITIAL     MH34(2,6),935
INITIAL     MH34(2,7),974
INITIAL     MH34(3,3),955
INITIAL     MH34(3,4),946
INITIAL     MH34(3,5),969
INITIAL     MH34(3,6),972
INITIAL     MH34(3,7),987
INITIAL     MH34(4,3),983
INITIAL     MH34(4,4),968
INITIAL     MH34(4,5),974
INITIAL     MH34(4,6),991
INITIAL     MH34(5,3),994
INITIAL     MH34(5,5),990
INITIAL     MH35(1-4,2),4
INITIAL     MH35(4-5,3),125
INITIAL     MH35(5-6,5),400
INITIAL     MH35(1-2,6),111
INITIAL     MH35(4-5,6),333
INITIAL     MH35(4-5,7),143
INITIAL     MH35(2-4,8),250
INITIAL     MH35(5-6,8),500
INITIAL     MH35(3-6,10),667
INITIAL     MH35(3-4,11),333
INITIAL     MH35(1-6,12-14),1000
INITIAL     MH35(1,14),0
INITIAL     MH35(2,10),333
INITIAL     MH35(2,11),167
INITIAL     MH35(3,6),222
INITIAL     MH35(4,5),200
INITIAL     MH35(5,1),10
INITIAL     MH35(5,2),14
INITIAL     MH35(5,9),200
INITIAL     MH35(5,11),500
INITIAL     MH35(6,1),14
INITIAL     MH35(6,2),25
INITIAL     MH35(6,3),56
INITIAL     MH35(6,4),188
INITIAL     MH35(6,6),556
INITIAL     MH35(6,7),429
INITIAL     MH35(6,9),400
INITIAL     MH35(6,11),833
```

Initializes the ceiling and visibility matrixes for various wind directions and velocities.

(continued)

```
* LOGAN
         INITIAL     MH101(1,1),18
         INITIAL     MH101(2,1),13
         INITIAL     MH101(1,3),24
         INITIAL     MH101(1,4),19
         INITIAL     MH101(2,2),7
         INITIAL     MH101(2,3),23
         INITIAL     MH101(2,4),7
         INITIAL     MH101(3-4,1),1
         INITIAL     MH101(3-4,2),40
         INITIAL     MH101(3,3),133
         INITIAL     MH101(3-18,4),1
         INITIAL     MH101(4,3),134
         INITIAL     MH101(5-6,1),2
         INITIAL     MH101(5-6,2),270
         INITIAL     MH101(5,3),135
         INITIAL     MH101(6,3),136
         INITIAL     MH101(7-8,1),3
         INITIAL     MH101(7-8,2),220
         INITIAL     MH101(7,3),137
         INITIAL     MH101(8,3),138
         INITIAL     MH101(9-10,1),4
         INITIAL     MH101(9,3),139
         INITIAL     MH101(9-10,2),330
         INITIAL     MH101(10,3),140
         INITIAL     MH101(11-12,1),5
         INITIAL     MH101(11-12,2),150
         INITIAL     MH101(11,3),141
         INITIAL     MH101(12,3),142
         INITIAL     MH101(13-14,1),4
         INITIAL     MH101(13,3),139
         INITIAL     MH101(13-14,2),330
         INITIAL     MH101(14,3),140
         INITIAL     MH101(15-16,1),1
         INITIAL     MH101(15-16,2),40
         INITIAL     MH101(15,3),133
         INITIAL     MH101(16,3),134
         INITIAL     MH101(17-18,1),3
         INITIAL     MH101(17-18,2),220
         INITIAL     MH101(17,3),137
         INITIAL     MH101(18,3),138
```

Initializes airport definition matrix for Logan.

```
         INITIAL     MX001(1-22,1-5),680100
         INITIAL     MX001(3,1-5),820150
         INITIAL     MX001(4,1-5),820200
         INITIAL     MX001(1-4,2),460100
         INITIAL     MX001(5-7,3),560100
         INITIAL     MX001(5,5),780100
         INITIAL     MX001(6,5),780125
         INITIAL     MX001(7,1-2),820150
         INITIAL     MX001(7,4),820150
         INITIAL     MX001(7,5),780150
         INITIAL     MX001(8,1-2),820200
         INITIAL     MX001(8,3),560125
         INITIAL     MX001(8,4),820200
         INITIAL     MX001(8,5),780175
         INITIAL     MX001(9-12,1),216050
         INITIAL     MX001(9-12,5),268075
         INITIAL     MX001(11,2-4),820150
         INITIAL     MX001(12,2-4),820200
         INITIAL     MX001(13-16,1),460075
         INITIAL     MX001(13-15,5),580100
         INITIAL     MX001(13-15,5),580100
         INITIAL     MX001(15,2-4),820150
         INITIAL     MX001(16,2-4),820200
         INITIAL     MX001(16,5),580125
         INITIAL     MX001(19,1-5),820150
         INITIAL     MX001(20,1-5),820200
         INITIAL     MX001(23,1-5),820150
         INITIAL     MX001(24,1-5),820200
         INITIAL     MX001(21-24,3),420100
         INITIAL     MX001(25-27,1),620050
         INITIAL     MX001(25-28,2),460100
         INITIAL     MX001(25-27,3),540100
         INITIAL     MX001(25-27,4),480050
         INITIAL     MX001(25,5),800100
         INITIAL     MX001(26,5),800175
         INITIAL     MX001(27,5),800150
         INITIAL     MX001(28,5),800175
         INITIAL     MX001(28,4),480100
         INITIAL     MX001(28,3),540125
         INITIAL     MX001(28,1),620100
```

Initializes the minimum ceiling and visibility for the various approaches and runways at Logan.

```
         INITIAL     MH133(1,1),2
         INITIAL     MH133(1,2),4
         INITIAL     MH133(2,1),4
         INITIAL     MH133(2,2),7
         INITIAL     MH133(3-4,1),15
```

Initializes the matrixes needed for determining the facilities required for various approaches to Logan.

(continued)

```
INITIAL   MH133(3,2),10
INITIAL   MH133(3,3),7
INITIAL   MH133(3,5),19
INITIAL   MH133(3,6),23
INITIAL   MH133(3-5,7),56
INITIAL   MH133(3-4,8),43
INITIAL   MH133(4,2),7
INITIAL   MH133(5,1),35
INITIAL   MH133(5,5),19
INITIAL   MH133(6,1),15
INITIAL   MH133(6,2),7
INITIAL   MH133(6,3),35
INITIAL   MH133(7,1),37
INITIAL   MH134(1,1),2
INITIAL   MH134(1,2),4
INITIAL   MH134(2,1),4
INITIAL   MH134(2,2),7
INITIAL   MH134(3-4,1),15
INITIAL   MH134(3-4,2),2
INITIAL   MH134(3-4,3),3
INITIAL   MH134(3,5),19
INITIAL   MH134(3,6),23
INITIAL   MH134(3-5,7),56
INITIAL   MH134(3-4,8),43
INITIAL   MH134(4,4),10
INITIAL   MH134(5,1),35
INITIAL   MH134(5,5),19
INITIAL   MH134(6,1),15
INITIAL   MH134(6,2),2
INITIAL   MH134(6,3),3
INITIAL   MH134(7,1),37
INITIAL   MH135(1-2,1),4
INITIAL   MH135(1-2,2),7
INITIAL   MH135(1,8),48
INITIAL   MH135(3-4,1),16
INITIAL   MH135(3,2),11
INITIAL   MH135(3,3),2
INITIAL   MH135(3,4),3
INITIAL   MH135(3,5),20
INITIAL   MH135(3,6),24
INITIAL   MH135(4,2),7
INITIAL   MH135(5,1),7
INITIAL   MH135(6,1),15
INITIAL   MH135(6,2),2
INITIAL   MH135(6,3),3
INITIAL   MH135(6,4),35
INITIAL   MH135(7,1),37
INITIAL   MH136(1-2,1),4
INITIAL   MH136(1,2),2
INITIAL   MH136(1,8),48
INITIAL   MH136(2,2),7
INITIAL   MH136(3-4,1),16
INITIAL   MH136(3,2),11
INITIAL   MH136(3,3),2
INITIAL   MH136(3,4),3
INITIAL   MH136(3,5),20
INITIAL   MH136(3,6),24
INITIAL   MH136(4,2),7
INITIAL   MH136(5,1),7
INITIAL   MH136(5,5),20
INITIAL   MH136(6,1),15
INITIAL   MH136(6,2),7
INITIAL   MH136(6,3),35
INITIAL   MH136(7,1),37
INITIAL   MH137(1-2,1),2
INITIAL   MH137(1-2,2),4
INITIAL   MH137(2-3,3),7
INITIAL   MH137(2,8),44
INITIAL   MH137(3-4,1),15
INITIAL   MH137(3,2),10
INITIAL   MH137(3,5),19
INITIAL   MH137(3,6),23
INITIAL   MH137(4,2),7
INITIAL   MH137(5-6,1),35
INITIAL   MH137(5,5),19
INITIAL   MH137(6,2),15
INITIAL   MH137(6,3),7
INITIAL   MH137(6,8),44
INITIAL   MH137(7,1),37
INITIAL   MH138(1-2,1),2
INITIAL   MH138(1-2,2),4
INITIAL   MH138(2,8),44
INITIAL   MH138(3-4,1),15
INITIAL   MH138(3-4,2),2
INITIAL   MH138(3-4,3),3
INITIAL   MH138(3,4),10
```

Initializes the matrixes needed for determining the facilities required for various approaches to Logan.

(continued)

```
        INITIAL     MH138(3,5),19
        INITIAL     MH138(3,6),23
        INITIAL     MH138(5,1),35
        INITIAL     MH138(5,5),19
        INITIAL     MH138(6,1),15
        INITIAL     MH138(6,2),2
        INITIAL     MH138(6,3),3
        INITIAL     MH138(6,8),44
        INITIAL     MH138(7,1),37
        INITIAL     MH139(1-2,1),4
        INITIAL     MH139(1-2,2),7
        INITIAL     MH139(1,7),57
        INITIAL     MH139(1,8),46
        INITIAL     MH139(3-4,1),16
        INITIAL     MH139(3,2),11
        INITIAL     MH139(3,3),2
        INITIAL     MH139(3,4),3
        INITIAL     MH139(3,5),20
        INITIAL     MH139(3,6),24
        INITIAL     MH139(3,7),57
        INITIAL     MH139(4,2),7
        INITIAL     MH139(5,1),7
        INITIAL     MH139(5,5),20
        INITIAL     MH139(5,7),57
        INITIAL     MH139(6,1),15
        INITIAL     MH139(6,2),2
        INITIAL     MH139(6,3),3
        INITIAL     MH139(6,4),35
        INITIAL     MH139(7,1),37
        INITIAL     MH140(1,1),2
        INITIAL     MH140(1-2,2),4
        INITIAL     MH140(1,7),57
        INITIAL     MH140(1,8),46
        INITIAL     MH140(2-6,1),7
        INITIAL     MH140(3-4,2),16
        INITIAL     MH140(3,3),11
        INITIAL     MH140(3,5),20
        INITIAL     MH140(3,6),24
        INITIAL     MH140(3,7),57
        INITIAL     MH140(5,5),20
        INITIAL     MH140(5,7),57
        INITIAL     MH140(6,2),15
        INITIAL     MH140(6,3),35
        INITIAL     MH140(7,1),37
        INITIAL     MH141(1-2,1),4
        INITIAL     MH141(1-4,2),7
        INITIAL     MH141(2,8),45
        INITIAL     MH141(3-4,1),14
        INITIAL     MH141(3,3),9
        INITIAL     MH141(3,5),18
        INITIAL     MH141(3,6),22
        INITIAL     MH141(4,8),45
        INITIAL     MH141(6,1),15
        INITIAL     MH141(6,2),7
        INITIAL     MH141(6,3),35
        INITIAL     MH141(7,1),37
        INITIAL     MH142(1-2,1),4
        INITIAL     MH142(1,2),2
        INITIAL     MH142(2,2),7
        INITIAL     MH142(2,8),45
        INITIAL     MH142(3-4,1),14
        INITIAL     MH142(3-4,2),2
        INITIAL     MH142(3-4,3),1
        INITIAL     MH142(3,4),9
        INITIAL     MH142(3,5),18
        INITIAL     MH142(3,6),22
        INITIAL     MH142(4,8),45
        INITIAL     MH142(6,1),1[illegible]
        INITIAL     MH142(6,2),2
        INITIAL     MH142(6,3),1
        INITIAL     MH142(6,4),35
        INITIAL     MH142(7,1),37
* BEDFORD
        INITIAL     MH106(1-2,1),6
        INITIAL     MH106(1,2),7
        INITIAL     MH106(1-2,3),24
        INITIAL     MH106(1,4),133
        INITIAL     MH106(2,4),5
        INITIAL     MH106(3,1),1
        INITIAL     MH106(3,2),110
        INITIAL     MH106(3,3),143
        INITIAL     MH106(4-6,3),156
        INITIAL     MH106(3-6,4),2
        INITIAL     MH106(4,1),2
        INITIAL     MH106(4,2),290
        INITIAL     MH106(5,2),230
```

Initializes the matrixes needed for determining the facilities required for various approaches to Logan.

Initializes matrixes, as in Logan, to define the Bedford airport, weather minimums, and approach facilities required.

(continued)

```
          INITIAL     MH106(5,1),3
          INITIAL     MH106(6,2),50
          INITIAL     MH106(6,1),4
          INITIAL     MH143(1,1),53
          INITIAL     MH143(1-4,5),17
          INITIAL     MH143(2-3,1),12
          INITIAL     MH143(2,2),8
          INITIAL     MH143(2,3),1
          INITIAL     MH143(2,6),21
          INITIAL     MH143(2,8),64
          INITIAL     MH143(3,2),1
          INITIAL     MH143(4,1),4
          INITIAL     MH143(4,2),53
          INITIAL     MH143(5,1),1
          INITIAL     MH143(5,2),4
          INITIAL     MX002(1-2,1-4),700100
          INITIAL     MX002(3,1),700100
          INITIAL     MX002(3,2-4),720150
          INITIAL     MX002(4,1),700125
          INITIAL     MX002(4,2-4),760200
          INITIAL     MX002(5-8,1),383100
          INITIAL     MX002(9-11,1),660100
          INITIAL     MX002(9-10,2-4),680100
          INITIAL     MX002(11,2-4),720150
          INITIAL     MX002(12,1),660125
          INITIAL     MX002(12,2-4),760200
          INITIAL     MX002(13-14,1-4),800100
          INITIAL     MX002(15,1-4),800150
          INITIAL     MX002(15,2),800125
          INITIAL     MX002(16,1-4),800200
          INITIAL     MX002(16,2),800150
          INITIAL     MX002(17-18,1-4),680100
          INITIAL     MX002(19,1-4),720150
          INITIAL     MX002(19,2-3),680100
          INITIAL     MX002(20,1-4),760200
          INITIAL     MX002(20,3),680125
          INITIAL     MH156(1,1),53
          INITIAL     MH156(1-4,5),53
          INITIAL     MH156(1-4,5),17
          INITIAL     MH156(2-3,1),1
          INITIAL     MH156(2-3,2),12
          INITIAL     MH156(2,3),8
          INITIAL     MH156(4-5,1),4
          INITIAL     MH156(4,2),53
          INITIAL     MH156(5,2),1
* BEVERLY
          INITIAL     MH107(1-2,1),6
          INITIAL     MH107(1,2),8
          INITIAL     MH107(1,3),18
          INITIAL     MH107(1,4),108
          INITIAL     MH107(2,3),24
          INITIAL     MH107(2,4),4
          INITIAL     MH107(3,1),1
          INITIAL     MH107(3,2),160
          INITIAL     MH107(3-6,3),144
          INITIAL     MH107(3-6,4),3
          INITIAL     MH107(4,1),2
          INITIAL     MH107(4,2),340
          INITIAL     MH107(5,1),3
          INITIAL     MH107(5,2),90
          INITIAL     MH107(6,1),4
          INITIAL     MH107(6,2),270
          INITIAL     MH144(1,1),25
          INITIAL     MH144(2-4,1),4
          INITIAL     MH144(2,2),3
          INITIAL     MH144(2,3),6
          INITIAL     MH144(3-4,2),33
          INITIAL     MH144(3-4,3),1
          INITIAL     MH144(4,4),1
          INITIAL     MX003(1-2,1-4),600100
          INITIAL     MX003(3,1-4),600150
          INITIAL     MX003(4,1-4),700200
          INITIAL     MX003(5-7,1-4),640100
          INITIAL     MX003(7,2-4),640150
          INITIAL     MX003(8,1),640125
          INITIAL     MX003(8,2-4),700200
          INITIAL     MX003(9-12,1),580100
          INITIAL     MX003(9-10,2-4),600100
          INITIAL     MX003(11,2-4),600150
          INITIAL     MX003(12,2-4),700200
          INITIAL     MX003(13-16,1),500100
          INITIAL     MX003(13-14,2-4),600100
          INITIAL     MX003(15,2-4),600150
          INITIAL     MX003(16,2-4),700200
```

Bedford continued

Initializes matrixes, as in Logan, to define the Beverly airport, weather minimums, and approach facilities required.

(continued)

```
* FITCHBURG
        INITIAL    MH108(1-2,1),5
        INITIAL    MH108(1,2),8
        INITIAL    MH108(1,3),18
        INITIAL    MH108(1,4),350
        INITIAL    MH108(2,3),24
        INITIAL    MH108(2,4),1
        INITIAL    MH108(3,1),1
        INITIAL    MH108(3,2),140
        INITIAL    MH108(3-5,3),145
        INITIAL    MH108(3-5,4),4
        INITIAL    MH108(4,1),2
        INITIAL    MH108(4,2),320
        INITIAL    MH108(5,1),3
        INITIAL    MH108(5,2),200
        INITIAL    MX004(1,1-4),1140100
        INITIAL    MX004(2,1-4),1400175
        INITIAL    MX004(3,1-4),1420200
        INITIAL    MX004(4,1-4),1600200
        INITIAL    MH145(1,1),32
```

Initializes matrixes, as in Logan, to define the Fitchburg airport, weather minimums, and approach facilities required

```
* FT DEVENS
        INITIAL    MH109(1-2,1),6
        INITIAL    MH109(1-2,3),24
        INITIAL    MH109(1,4),268
        INITIAL    MH109(2,4),1
        INITIAL    MH109(3,1),1
        INITIAL    MH109(3,2),140
        INITIAL    MH109(3-6,3),146
        INITIAL    MH109(3-6,4),5
        INITIAL    MH109(4,1),2
        INITIAL    MH109(4,2),320
        INITIAL    MH109(5,1),3
        INITIAL    MH109(5,2),20
        INITIAL    MH109(6,1),4
        INITIAL    MH109(6,2),200
        INITIAL    MX005(1-2,1-4),940100
        INITIAL    MX005(3,1),940125
        INITIAL    MX005(3,2-4),940150
        INITIAL    MX005(4,1),940150
        INITIAL    MX005(4,2-4),940200
        INITIAL    MH146(1,1),26
```

Initializes matrixes, as in Logan, to define the Ft. Devens airport, weather minimums, and approach facilities required.

```
* LAWRENCE
        INITIAL    MH110(1-2,1),6
        INITIAL    MH110(1,2),8
        INITIAL    MH110(1,3),21
        INITIAL    MH110(1,4),147
        INITIAL    MH110(2,3),24
        INITIAL    MH110(2,4),2
        INITIAL    MH110(3,1),1
        INITIAL    MH110(3,2),230
        INITIAL    MH110(3,3),147
        INITIAL    MH110(4,3),157
        INITIAL    MH110(5-6,3),158
        INITIAL    MH110(3-6,4),6
        INITIAL    MH110(4,1),2
        INITIAL    MH110(4,2),50
        INITIAL    MH110(5,1),3
        INITIAL    MH110(5,2),140
        INITIAL    MH110(6,2),320
        INITIAL    MH110(6,1),4
        INITIAL    MX006(1-3,1),700100
        INITIAL    MX006(1-2,2-4),780100
        INITIAL    MX006(3,2-4),780150
        INITIAL    MX006(4,1),700125
        INITIAL    MX006(4,2-4),780200
        INITIAL    MX006(5-6,1),780100
        INITIAL    MX006(5-7,2),760100
        INITIAL    MX006(5-6,3-4),780100
        INITIAL    MX006(7,1),780150
        INITIAL    MX006(7,3-4),780125
        INITIAL    MX006(8,1),780200
        INITIAL    MX006(8,2),760125
        INITIAL    MX006(8,3-4),780200
        INITIAL    MH158(1,1),1
        INITIAL    MH158(1,2),3
        INITIAL    MH158(2,1),13
        INITIAL    MH158(2,2),26
        INITIAL    MH157(1,1),1
        INITIAL    MH157(1,2),3
        INITIAL    MH157(2,1),13
        INITIAL    MH157(2,2),28
        INITIAL    MH157(2,8),41
        INITIAL    MH147(1,1),1
        INITIAL    MH147(1,2),3
        INITIAL    MH147(1,8),41
        INITIAL    MH147(2,1),13
        INITIAL    MH147(2,2),28
```

Initializes matrixes, as in Logan, to define the Lawrence airport, weather minimums, and approach facilities required.

(continued)

```
* MANSFIELD
        INITIAL    MH111(1-2,1),4
        INITIAL    MH111(1,2),8
        INITIAL    MH111(1,3),18
        INITIAL    MH111(1,4),124
        INITIAL    MH111(2,3),24
        INITIAL    MH111(2,4),2
        INITIAL    MH111(3,1),1
        INITIAL    MH111(3,2),140
        INITIAL    MH111(3-4,3),148
        INITIAL    MH111(3-4,4),7
        INITIAL    MH111(4,2),320
        INITIAL    MH111(4,1),2
        INITIAL    MX007(1-2,1-2),860100      Initializes matrixes, as in Logan, to define the Mansfield
        INITIAL    MX007(3,1-2),860150        airport, weather minimums, and approach facilities required.
        INITIAL    MX007(4,1-2),860200
        INITIAL    MX007(5-6,1-2),780100
        INITIAL    MX007(7,1-2),780150
        INITIAL    MX007(8,1-2),800200
        INITIAL    MH148(1-2,1),2
        INITIAL    MH148(2,2),5
* MARSHFIELD
        INITIAL    MH112(1-2,1),4
        INITIAL    MH112(1,2),8
        INITIAL    MH112(1,3),18
        INITIAL    MH112(1,4),9
        INITIAL    MH112(2,3),24
        INITIAL    MH112(2,4),1
        INITIAL    MH112(3,1),1
        INITIAL    MH112(3,2),60              Initializes matrixes, as in Logan, to define the Marshfield
        INITIAL    MH112(3-4,3),149           airport, weather minimums, and approach facilities required.
        INITIAL    MH112(3-4,4),8
        INITIAL    MH112(4,1),2
        INITIAL    MH112(4,2),240
        INITIAL    MX008(1-2,1-2),600100
        INITIAL    MX008(3,1-2),600150
        INITIAL    MX008(4,1-2),640200
        INITIAL    MH149(1,1),2
        INITIAL    MH149(1,2),5
* NEW BURYPORT
        INITIAL    MH113(1-2,1),4
        INITIAL    MH113(1,2),8
        INITIAL    MH113(1,3),18
        INITIAL    MH113(1,4),11
        INITIAL    MH113(2,3),24
        INITIAL    MH113(2,4),1
        INITIAL    MH113(3,1),1               Initializes matrixes, as in Logan, to define the Newburyport
        INITIAL    MH113(3,2),100             airport, weather minimums, and approach facilities required.
        INITIAL    MH113(3-4,3),150
        INITIAL    MH113(3-4,4),9
        INITIAL    MH113(4,1),2
        INITIAL    MH113(4,2),280
        INITIAL    MX009(1,1-2),740100
        INITIAL    MX009(2-4,1-2),1500500
        INITIAL    MH150(1,1),13
        INITIAL    MH150(1,2),17
* NORWOOD
        INITIAL    MH114(1-2,1),6
        INITIAL    MH114(1,2),7
        INITIAL    MH114(1,3),23
        INITIAL    MH114(1,4),49              Initializes matrixes, as in Logan, to define the Norwood
        INITIAL    MH114(2,3),24              airport, weather minimums, and approach facilities required.
        INITIAL    MH114(2,4),4
        INITIAL    MH114(3,1),1
        INITIAL    MH114(3,2),350
        INITIAL    MH114(3-6,3),151
        INITIAL    MH114(3-6,4),10
        INITIAL    MH114(4,1),2
        INITIAL    MH114(4,2),170
        INITIAL    MH114(5,1),3
        INITIAL    MH114(5,2),100
        INITIAL    MH114(6,1),4
        INITIAL    MH114(6,2),280
        INITIAL    MX010(1-3,1-4),640100
        INITIAL    MX010(3,2-4),640150
        INITIAL    MX010(4,1),640125
        INITIAL    MX010(4,2-4),740200
        INITIAL    MX010(5-7,1),580100
        INITIAL    MX010(5-6,2-4),640100
        INITIAL    MX010(7,2-4),640150
        INITIAL    MX010(8,1),580125
        INITIAL    MX010(8,2-4),740200
        INITIAL    MX010(9,1-4),840100
        INITIAL    MX010(10,1-4),840125
        INITIAL    MX010(11,1-4),840150
        INITIAL    MX010(12,1-4),840175
```

(continued)

```
         INITIAL    MX010(13-15,1),580100
         INITIAL    MX010(16,1),580125
         INITIAL    MH151(1-2,1),31
         INITIAL    MH151(2,2),34
         INITIAL    MH151(2,4),52
         INITIAL    MH151(3-4,1),2
         INITIAL    MH151(4,2),5
```

Norwood continued

```
* PLYMOUTH
         INITIAL    MH115(1-2,1),6
         INITIAL    MH115(1,2),8
         INITIAL    MH115(1,3),18
         INITIAL    MH115(1,4),149
         INITIAL    MH115(2,3),24
         INITIAL    MH115(2,4),1
         INITIAL    MH115(3,1),1
         INITIAL    MH115(3,2),60
         INITIAL    MH115(3-6,3),152
         INITIAL    MH115(3-6,4),11
         INITIAL    MH115(4,1),2
         INITIAL    MH115(4,2),330
         INITIAL    MH115(5,1),3
         INITIAL    MH115(5,2),240
         INITIAL    MH115(6,1),4
         INITIAL    MH115(6,2),150
         INITIAL    MH152(1,1),30
         INITIAL    MX011(1-3,1-4),600100
         INITIAL    MX011(3,2-4),600150
         INITIAL    MX011(4,1-4),1500500
```

Initializes matrixes, as in Logan, to define the Plymouth airport, weather minimums, and approach facilities required.

```
* S. WEYMOUTH
         INITIAL    MH116(1-2,1),6
         INITIAL    MH116(1-2,3),24
         INITIAL    MH116(1,4),161
         INITIAL    MH116(2,4),3
         INITIAL    MH116(3,1),1
         INITIAL    MH116(3,2),350
         INITIAL    MH116(3,3),153
         INITIAL    MH116(3-6,4),12
         INITIAL    MH116(4,1),2
         INITIAL    MH116(4,2),80
         INITIAL    MH116(5,1),3
         INITIAL    MH116(5,2),260
         INITIAL    MH116(6,1),4
         INITIAL    MH116(6,2),170
         INITIAL    MH116(4,3),159
         INITIAL    MH116(5,3),160
         INITIAL    MH116(6,3),161
         INITIAL    MX012(1-4,1),620100
         INITIAL    MX012(1-2,2-4),640100
         INITIAL    MX012(3,2-4),640150
         INITIAL    MX012(4,2-4),720200
         INITIAL    MX012(5-6,1-4),640100
         INITIAL    MX012(7,1-4),640150
         INITIAL    MX012(8,1-4),720200
         INITIAL    MX012(9-12,1),520100
         INITIAL    MX012(9-12,2),540100
         INITIAL    MX012(9-12,3),560100
         INITIAL    MX012(9-10,4),640100
         INITIAL    MX012(11,4),640150
         INITIAL    MX012(12,4),720200
         INITIAL    MH153(1-2,1),2
         INITIAL    MH153(1-2,2),5
         INITIAL    MH153(1,3),36
         INITIAL    MH153(3,1),27
         INITIAL    MH153(1,1),27
         INITIAL    MH153(3,1),2
         INITIAL    MH153(3,2),5
         INITIAL    MH153(3,3),36
         INITIAL    MH153(3,8),61
         INITIAL    MH153(1,2-3),0
         INITIAL    MH159(1,1),27
         INITIAL    MH159(2-3,1),2
         INITIAL    MH159(2-3,2),5
         INITIAL    MH159(3,3),36
         INITIAL    MH159(3,8),58
         INITIAL    MH160(1,1),27
         INITIAL    MH160(2-3,1),2
         INITIAL    MH160(2-3,2),5
         INITIAL    MH160(3,3),36
         INITIAL    MH160(3,7),62
         INITIAL    MH160(3,8),59
         INITIAL    MH161(1,1),27
         INITIAL    MH161(2-3,1),2
         INITIAL    MH161(2-3,2),5
         INITIAL    MH161(3,3),36
```

Initializes matrixes, as in Logan, to define the S. Weymouth airport, weather minimums, and approach facilities required.

(continued)

```
* TAUNTON
        INITIAL     MH117(1-2,1),4
        INITIAL     MH117(1,2),8
        INITIAL     MH117(1,3),18
        INITIAL     MH117(1,4),92
        INITIAL     MH117(2,3),24
        INITIAL     MH117(2,4),3
        INITIAL     MH117(3,1),1
        INITIAL     MH117(3,2),300
        INITIAL     MH117(3-4,3),154
        INITIAL     MH117(3-4,4),13
        INITIAL     MH117(4,1),2
        INITIAL     MH117(4,2),120
        INITIAL     MH154(1,1),29
        INITIAL     MH154(2-3,1),2
        INITIAL     MH154(3,2),5
        INITIAL     MX013(1-3,1-2),660100
        INITIAL     MX013(3,2),660150
        INITIAL     MX013(4,1),660125
        INITIAL     MX013(4,2),660200
        INITIAL     MX013(5-7,1-2),760150
        INITIAL     MX013(8,1-2),760200
        INITIAL     MX013(9,1-2),580150
        INITIAL     MX013(10-11,1-2),620150
        INITIAL     MX013(12,1-2),620200
```

Initializes matrixes, as in Logan, to define the Taunton airport, weather minimums, and approach facilities required.

```
* TEW-MAL
        INITIAL     MH118(1-2,1),6
        INITIAL     MH118(1,2),8
        INITIAL     MH118(1,3),18
        INITIAL     MH118(1,4),92
        INITIAL     MH118(2,3),24
        INITIAL     MH118(2,4),2
        INITIAL     MH118(3,1),1
        INITIAL     MH118(3,2),210
        INITIAL     MH118(3-6,3),155
        INITIAL     MH118(3-6,4),14
        INITIAL     MH118(4,1),2
        INITIAL     MH118(4,2),30
        INITIAL     MH118(5,1),3
        INITIAL     MH118(5,2),180
        INITIAL     MH118(6,1),4
        INITIAL     MH118(6,2),360
        INITIAL     MH155(1,1),1
        INITIAL     MH155(1,2),3
        INITIAL     MH155(2,1),28
        INITIAL     MX014(1-3,1-4),640100
        INITIAL     MX014(3,2-4),640150
        INITIAL     MX014(4,2-4),920200
        INITIAL     MX014(4,1),640175
        INITIAL     MX014(5-6,1-4),760100
        INITIAL     MX014(7,1-4),760150
        INITIAL     MX014(8,1-4),920200
```

Initializes matrixes, as in Logan, to define the Tew-Mac airport, weather minimums, and approach facilities required.

```
        INITIAL     XH$FACIL,63
        INITIAL     XH$ARSEP,1
        INITIAL     XH$WTCHG,180
        INITIAL     XH$WTVAR,15
        INITIAL     XH$DAYST,8
        INITIAL     XH$DAYEN,18
        INITIAL     XH$RUNWY,5
        INITIAL     XH$DIVRT,500
        INITIAL     XH$AIRPT,18
        INITIAL     XH$HOLD,5
        INITIAL     XH$NORAD,15
        INITIAL     XH$RADDW,16
        INITIAL     XH$TOF,10
        INITIAL     XH$WNMAX,15
        INITIAL     XH$MAXTM,30
        INITIAL     XH$TAKQU,3
        INITIAL     XH$LNDST,5
        INITIAL     XH$MNONE,-1
        INITIAL     XH$LNDSP,2
        INITIAL     XH$TAKVS,100
        INITIAL     XH$TAKCL,375
        INITIAL     XH$CALM,5

 PMFTY FUNCTION     RN2,C2
0,50/.999,150
 WNVEL FUNCTION     P1,D10
4,3/5,3/6,7/7,7/8,12/9,12/10,22/11,22/12,30/13,30
 CEIL  FUNCTION     P3,D7
1,1000/2,750/3,500/4,400/5,300/6,200/7,50
 VISAB FUNCTION     P1,D7
1,25/2,50/3,80/4,100/5,150/6,200/7,300
 PMOFY FUNCTION     RN2,C2
0,150/.999,450
 MODSP FUNCTION     P1,D4
```

(continued)

```
1,1005/2,18060/3,2015/4,24060
 LOGRN FUNCTION   P1,C13
0,100/1,7/10,4.6/100,2.3/200,1.61/300,1.2/400,.92/500,.69/600,.51/
700,.36/800,.22/900,.11/999,.001
 1     FUNCTION   RN1,C2
0,71/1,92
 2     FUNCTION   RN1,C2
0,91/1,122
 3     FUNCTION   RN1,C2
0,121/1,142
 4     FUNCTION   RN1,C2
0,141/1,167
 CLOCK VARIABLE   (C1/60)'24+1
 CEILO FVARIABLE  FN$CEIL+FN$PMOFY-300
 MTBF  FVARIABLE  FN$LOGRN*P3
 MTTR  FVARIABLE  FN$LOGRN*P4
 VISAB FVARIABLE  FN$VISAB+(FN$PMFTY-100)/2
 WIVAR FVARIABLE  FN$LOGRN*XH$WTVAR
 CEIL  FVARIABLE  FN$CEIL+FN$PMFTY-100
 WTCHG FVARIABLE  FN$LOGRN*XH$WTCHG
 TYPEA FVARIABLE  XH$VFRWT*MH$VFRPT(P2,XH$TYPCT)+V$TYPED
 TYPED FVARIABLE  XH$IFRWT*MH$IFRPT(P2,XH$TYPCT)
 DESTN FVARIABLE  XH$VFRWT*MH$VFRAC(V$CLOCK,XH$TYPCT)+V$DEST1
 DEST1 FVARIABLE  XH$IFRWT*MH$IFRAC(V$CLOCK,XH$TYPCT)
 DELTM FVARIABLE  60*V$DELT2
 DELT2 FVARIABLE  FN$LOGRN/(XH$VFRWT*MH$VFRAC(V$CLOCK,18)+V$DELT1)
 DELT1 FVARIABLE  XH$IFRWT*MH$IFRAC(V$CLOCK,18)
 TOF   FVARIABLE  (600*(MH$DSTN(P15,P2)/P3)+5)/10
 TOFNR FVARIABLE  (600*(MH$DSTNR(P15,P2)/P3)+5)/10
 TAKDY VARIABLE   M1-1
 DELAY VARIABLE   M1-P7
 DIRWN VARIABLE   XH$DIRWN*XH$DIRWN
 MOD   FVARIABLE  FN$MODSP/100+RN7*V$SPRED/1000
 SPRED VARIABLE   FN$MODSP'100
 LNDSP FVARIABLE  (10*(X$LNDTM*XH$LNDVL/60)+5)/10
 CLRD  BVARIABLE  X$TMCTR'L'P6
 TRLAC BVARIABLE  X$TMCTR'L'P6
 LEDAC BVARIABLE  X$TMCTR'GE'P6
 ARSEP FVARIABLE  (600*P1/P3+5)/10
 SEPAR FVARIABLE  (600*P1/XH$TRLVL+5)/10
 MDRWN FVARIABLE  XH$MNONE*XH$DIRWN
 WEATH BVARIABLE  XH$CEILT'GE'V$CEILT*XH$VISAT'GE'V$VISAT
 APPCT FVARIABLE  4*(P16-1)+P14
 CEILT VARIABLE   X$TESS/1000
 VISAT VARIABLE   X$TESS'1000
*
* WEATHER MODULE
* WEATHER PARAMETERS
*  P1-COUNTER
*  P2-RANDOM NUMBER COUNTER
*  P3-COUNTER
*  P4-CEILING MATRIX NUMBER
*  P5/VISABILITY MATRIX NUMBER
*  P6-DAY/NIGHT COUNTER
*
1            GENERATE   ,,,1,,6                 CREATE WEATHER TRANSACT
2            SPLIT      1,WTCL                  SEND TWIN TO CEIL CALC
3            SPLIT      1,WTVS                  SEND TWIN TO VIS CALC
4       WTA  ASSIGN     1,2                     INITIAL NIGHT TIME
5            ASSIGN     6,0                     INITIAL PARAMETER 6
6            ASSIGN     3,0                     INITIAL PARAMETER 3
7            TEST GE    V$CLOCK,XH$DAYST,WTE    IS IT DAYTIME
8            TEST L     V$CLOCK,XH$DAYEN,WTB    IS IT DAYTIME
9            ASSIGN     1,3                     INITIAL DAY TIME
10           ASSIGN     6,1                     DAY COUNTER
11      WTB  ASSIGN     2,RN2                   GET RANDOM NUMBER
12      WTC  ASSIGN     3+,1                    INCREMENT COUNTER
13           TEST LE    P2,MH1(P3,P1),WTC       IS WIND FROM THIS DIREC
14           SAVEVALUE  WNDIR,MH1(P3,1),H       STORE WIND DIRECTION
15           ASSIGN     2,RN2                   GET RANDOM NUMBER
16      WTD  ASSIGN     1+,2                    INCREMENT COUNTER
17           TEST LE    P1,11,WTE               IS VELOCITY DEFAULTED
18           TEST LE    P2,MH1(P3,P1),WTD       IS IT THIS VELOCITY
19      WTE  SAVEVALUE  WNVEL,FN$WNVEL,H        STORE WIND VELOCITY
20           ASSIGN     1-,3                    ASSIGN CEILING COUNTER
21           ASSIGN     2,RN2                   GET RANDOM NUMBER
22           ASSIGN     4,MH1(P3,12)            STORE CEILING MATRIX
23           ASSIGN     5,MH1(P3,13)            STORE VISIBILITY MATRIX
24           ASSIGN     3,0                     INITIAL COUNTER
25      WTF  ASSIGN     3+,1                    INCREMENT COUNTER
26           TEST LE    P3,6,WTG                IS CEILING DEFAULTED
27           TEST LE    P2,MH*4(P3,P1),WTF      IS THIS THE CEILING
28      WTG  SAVEVALUE  CEILP,P3,H              STORE CEILING
29           TEST E     P3,1,WTGG               IS IT VFR
30           SAVEVALUE  CEIL,FN$CEIL,H          SET CEIL TC MAX
31           TRANSFER   ,WTGGG                  GO TO VISAB CALC
```

(continued)

```
32    WTGG  TEST NE     P3,2,WTGGA                 IS CEILING 750
33          SAVEVALUE   CEIL,V$CEIL,H              STORE CEILING
34          TRANSFER    ,WTGGG                     GO TO VISAB CALC
35    WTGGA SAVEVALUE   CEIL,V$CEILO,H             STORE CEILING
36    WTGGG ASSIGN      3+,P3                      CALC VISIBILITY COUNTER
37          ASSIGN      3+,P6                      ACOUNT FOR DAYTIME
38          ASSIGN      3-,1                       MICKEY MOUSE
39          ASSIGN      1,0                        INITIAL COUNTER
40          ASSIGN      2,RN2                      GET RANDOM NUMBER
41    WTH   ASSIGN      1+,1                       INCREMENT COUNTER
42          TEST LE     P1,6,WTI                   IS VISIBILITY DEFAULTED
43          TEST LE     P2,MH*5(P1,P3),WTH         IS THIS THE VISIBILITY
44    WTI   SAVEVALUE   VISAP,P1,H                 STORE VISIBILITY
45          TEST E      P1,7,WTJ                   IS IT VFR
46          SAVEVALUE   VISAB,FN$VISAB,H           SET VISAB TO MAX
47          TRANSFER    ,WTJJ                      GO TO VFR CHECK
48    WTJ   SAVEVALUE   VISAB,V$VISAB,H            STORE VISAB
49    WTJJ  SAVEVALUE   IFRWT,1,H                  INITIAL IFR CONDITIONS
50          SAVEVALUE   VFRWT,0,H                  INITIAL IFR CONDITIONS
51          TEST E      XH$VISAP,7,WTK             IS VISAB AT MAX
52          TEST E      XH$CEILP,1,WTK             IS CEIL AT MAX
53          SAVEVALUE   IFRWT,0,H                  INITIAL VFR CONDITIONS
54          SAVEVALUE   VFRWT,1,H                  INITIAL VFR CONDITIONS
55    WTK   ASSIGN      1,RN2                      GET RANDOM NUMBER
56          LOGIC S     CHANG                      WEATHER CHANGE
57          ADVANCE     V$WTCHG                    WAIT FOR WEATHER TO CHA
58          TRANSFER    ,WTA                       GO TO WEATHER CALC
59    WTCL  ASSIGN      3,XH$CEILP                 STORE CEILING PARAMETER
60          TEST NE     P3,1,WTCLL                 IS CEIL AT MAX
61          TEST NE     P3,2,WTCLA                 IS CEILING 750
62          SAVEVALUE   CEIL,V$CEIL,H              STORE CEILING
63          TRANSFER    ,WTCLB                     GO TO WEATHER CHANGE
64    WTCLA SAVEVALUE   CEIL,V$CEILO,H             STORE CEILING
65    WTCLB LOGIC S     CHANG                      WEATHER CHANGE
66    WTCLL ASSIGN      1,RN2                      GET RANDOM NUMBER
67          ADVANCE     V$WTVAR                    WAIT FOR WEATHER CHANGE
68          TRANSFER    ,WTCL                      GO CALC CEILING
69    WTVS  ASSIGN      1,XH$VISAP                 STORE VIS PARAMETER
70          TEST NE     P1,7,WTVSS                 IS VISAB AT MAX
71          SAVEVALUE   VISAB,V$VISAB,H            STORE VISIBILITY
72    WTVSS ASSIGN      1,RN2                      GET RANDOM NUMBER
73          LOGIC S     CHANG                      WEATHER CHANGE
74          ADVANCE     V$WTVAR                    WAIT FOR WEATHER CHANGE
75          TRANSFER    ,WTVS                      GO CALC VISSIBILITY
      *
      * CONTROL A/C'S LEAVING HOLD AREA ENTERING AIR CONTROLLED APPROACH
      *
76          GENERATE    ,,,1,,1                    CREATE TRANSACTION
77          SPLIT       1,ADI                      SEND TWIN TO RUNWAY MOD
78          GATE LS     FINI6                      WAIT FOR FACILITIES
79    AABF  LOGIC R     ENTER                      RESET A/C IN HOLD SWITC
80          GATE LS     ENTER                      WAIT FOR A/C TO ENTER H
81    AABG  GATE LR     ARCGO                      WAIT FOR AIR CONTROLLER
      * AIR CONTROLLER TAKES CONTROL OF A/C
82          UNLINK      HOARC,AAA,1,13,0,AABF      RELEASE A/C FROM HOLD
83          GATE LS     FINI5                      WAIT FOR A/C IN TEST
84          LOGIC R     FINI5                      A/C IN TEST
85          TRANSFER    ,AABG                      CHECK FOR NEXT A/C
      *
      * CREATE A/C AND LOAD INTO HOLD AREAS
      *
86          GENERATE    ,,,,,16                    CREATE A/C'S
87          GATE LR     FINI2                      WAIT FOR PREV A/C
88          LOGIC S     FINI2                      A/C IN CREATION
89          ASSIGN      1,RN1                      GET RANDOM NUMBER
90          ADVANCE     V$DELTM                    WAIT FOR A/C IN HOLD
91          LOGIC R     FINI2                      A/C CREATED
      * ASSIGN A/C TAIL NUMBER
92          SAVEVALUE   ACNUM+,1,H                 INCREMENT A/C TAIL NUM
93          ASSIGN      5,XH$ACNUM                 ASSIGN A/C TAIL NUM
      * ASSIGN A/C DESTINATION
94          ASSIGN      1,RN1                      CHOOSE RANDOM NUMBER
95          SAVEVALUE   TYPCT,0,H                  INITIAL AIRPORT COUNTER
96    ACC   SAVEVALUE   TYPCT+,1,H                 INCREMENT AIRPORT
97          TEST NE     XH$TYPCT,XH$AIRPT,ACD      CHECK ALL AIRPORTS
98          TEST G      P1,V$DESTN,ACD             IS THIS THE AIRPORT
99          TRANSFER    ,ACC                       GO CHECK AGAIN
100   ACD   ASSIGN      2,XH$TYPCT                 ASSIGN DESTINATION
      * ASSIGN A/C TYPE
101         SAVEVALUE   TYPCT,0,H                  INITIAL COUNTER
102         ASSIGN      1,RN1                      GET RANDOM NUMBER
103   AAD   SAVEVALUE   TYPCT+,1,H                 INCREMENT TYPE COUNTER
104         TEST G      P1,V$TYPEA,AAG             IS THIS THE TYPE
105         TEST E      XH$TYPCT,3,AAD             IS IT TYPE 4
106         SAVEVALUE   TYPCT,4,H                  TYPE 4 A/C
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107     AAG   ASSIGN      4,XH$TYPCT                            ASSIGN A/C TYPE
      * ASSIGN A/C WEIGHT CLASS AND CATAGORY
108           ASSIGN      1,RN1                                 GET RANDOM NUMBER
109           ASSIGN      8,0                                   INITIAL PARAMETER 8
110     ABA   ASSIGN      8+,1                                  INCREMENT COUNTER
111           TEST LE     P1,MH$CATWT(P4,P8),ABA                FIND CATAGORY OF A/C
112           ASSIGN      14,P8                                 STORE CATAGORY
113           ASSIGN      8,4                                   INITIAL COUNTER
114           ASSIGN      1,RN1                                 GET RANDOM NUMBER
115     ABB   ASSIGN      8+,1                                  INCREMENT COUNTER
116           TEST LE     P1,MH$CATWT(P4,P8),ABB                FIND WEIGHT CLASS
117           ASSIGN      9,P8                                  STORE WEIGHT CLASS
118           ASSIGN      9-,4                                  CALC WEIGHT CLASS
      * ASSIGN A/C SPEED
119           ASSIGN      3,FN*14                               CALC A/C SPEED
      * LOAD DISPLAY MATRIX
120           MSAVEVALUE DELAY+,1,P4,1,H                        STORE NUM A/C CREATED
121           TEST LE     P2,XH$HOLC,AEA                        IS DESTINATION SECONDAR
122     ABC   SAVEVALUE   ACCTR+,1,H                            INCREMENT CISPLAY COUNT
123           MSAVEVALUE DELAY+,2,P4,1,H                        STORE NUM PRI A/C
124           ASSIGN      15,1                                  A/C DESTINATION CHANGED
125           ASSIGN      10,P5                                 LOAD A/C TAIL NUMBER
126           ASSIGN      5,XH$ACCTR                            ASSIGN DISPLAY COUNTER
127           ASSIGN      8,0                                   INITIAL PARAMETER 8
128           ASSIGN      1,0                                   INITIAL PARAMETER 1
129           LOGIC S     ENTER                                 A/C IN HOLC AREA
130           MARK                                               A/C MARK TIME
131           LINK        HDARC,P10                             LOAD A/C INTO HOLD AREA
      *
      * UNLOAD HOLD AREAS AND LAND A/C
      *
132     AAB   ADVANCE     P7                                    LAND A/C
133           GATE LR     FINI1                                 ENSURE ALL A/C'S IN SCH
134           UNLINK      P11,TERM,1,5,P5,ERR                   A/C OFF LAND SCHEDULE
135           TEST NE     V$DELAY,0,NDLY                        TEST FOR DELAY
136           MSAVEVALUE DELAY+,5,P4,1,H                        STORE NUM A/C DELAYED
137           MSAVEVALUE DELAY+,6,P4,V$DELAY,H                  STORE DELAY TIME
138     NDLY  SAVEVALUE   ARCGO-,1,H                            A/C NOT IN CONTROL
139           TEST L      XH$ARCGO,MH$ARSEP(XH$ARSEP,11),TERM1 CAN AIR CONTROL N
140           LOGIC R     ARCGO                                 ALLOW NEXT A/C
141     TERM1 ASSIGN      1,P4                                  STORE A/C TYPE
142           MSAVEVALUE DELAY+,9,P4,1,H                        STORE NUM A/C LANCED
143           SPLIT       1,TAA,,3                              REDUCE XACT SIZE
144           LOGIC S     LNDSP                                 NO SAME RUNWAY TAKEOFFS
145           ADVANCE     1                                     WAIT ONE MINUTE
146           TEST GE     XH$ARSEP,XH$NORAD,AABA                IS IT RADAR CONTROL
147           ADVANCE     2                                     WAIT ADDITIONAL 2 MINUT
148     AABA  LOGIC R     LNDSP                                 A/C CLEARED FOR TAKEOFF
149           TERMINATE                                          TERMINATE A/C
      *
      * TAKE OFF A/C
      *
150     TAA   ADVANCE     V$MOD                                 WAIT FOR TURN AROUND
151           PRIORITY    0                                     DECREASE PRIORITY
152           MSAVEVALUE DELAY+,13,P1,1,H
153           MARK                                               A/C MARK TIME
154           ASSIGN      2,C1                                  STORE CLOCK
155           SAVEVALUE   TAKOF+,1,H                            INCREMENT A/C COUNTER
156           ASSIGN      3,XH$TAKOF                            STORE A/C NUMBER
157           SPLIT       1,TAB                                 SEND TWIN TO SCH CHECK
158           LINK        TAKOF,P2                              A/C IN QUEUE
159     TAB   GATE  LR    TAKOF                                 IS A/C READY
160           LOGIC S     TAKOF                                 NO MORE A/C'S
161     TACC  GATE  LR    FINI1                                 IS CHECK CLEARED
162           LOGIC S     FINI1                                 A/C IN CHECK
163           SAVEVALUE   TMCTR,P2                              STORE ETA
164           UNLINK      1,TAD,1,BV$CLRD,,TBKOF                FIND NEXT LANDING A/C
165           GATE LS     CLRD                                  WAIT FOR A/C FOUND
166           LOGIC R     FINI1                                 TEST COMPLETED
167           LOGIC R     CLRD                                  A/C RETURNED TO CHAIN
168           SAVEVALUE   LNDTM-,C1                             MINUTES TO LAND TIME
169     TACD  TEST  G     XH$WNVEL,XH$WNMAX,TACA                IS WIND ABCVE MAX
170           GATE LR     LNDSP                                 WAIT FOR TAKEOFF
171     TACA  TEST  NE    V$LNDSP,0,TAKOF                       ANY LANDING A/C
172           TEST L      V$LNDSP,XH$LNDSP,TAKOF                ARE SEPAR CBSERVED
173           MSAVEVALUE DELAY+,12,P1,X$LNDTM,H                 STORE DELAY TIME
174           ADVANCE     X$LNDTM                               WAIT FOR A/C TO LAND
175           TRANSFER    ,TACC                                 GO TRY NEXT A/C
176     TAD   SAVEVALUE   LNDTM,P6                              STORE LANDING TIME
177           SAVEVALUE   LNDVL,P3,H                            STORE LANDING VELOCITY
178           LOGIC S     CLRD                                  A/C RECORDED
179           LINK        P11,P6                                RETURN A/C TO CHAIN
180     TBKOF LOGIC R     FINI1                                 TEST COMPLETED
181           LOGIC R     CLRD                                  A/C RETURNED TO CHAIN
182           SAVEVALUE   LNDTM,0                               ZERO LAND TIME
183           SAVEVALUE   LNDVL,0,H                             ZERO LAND SPEED
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184         TRANSFER   ,TACO                              GO TO TAKE CFF CHECK
185   TAKOF TEST  LE   XH$TAKVS,XH$VISAB,NOTAK            CHECK VISIBILITY
186         TEST LE    XH$TAKCL,XH$CEIL,NOTAK             CHECK CEILING
187         UNLINK     TAKOF,TERM,1,3,,ERR                TAKE OFF A/C
188         ADVANCE    1                                  WAIT 1 MINUTE
189         TEST GE    XH$ARSEP,XH$NORAD,TAE              IS IT RADAR ENVIRONMENT
190         ADVANCE    2                                  WAIT ANOTHER 2 MINUTES
191   TAE   LOGIC R    TAKOF                              NEXT A/C INTC CHECK
192         TEST NE    V$TAKDY,0,TAF                      ANY DELAYS
193         MSAVEVALUE DELAY+,10,P1,1,H                   STORE NUM A/C DELAYED
194         MSAVEVALUE DELAY+,11,P1,V$TAKDY,H             STORE DELAY TIME
195   TAF   TERMINATE                                     TERMINATE A/C
196   NOTAK GATE  LS   CHANG                              WAIT FOR WEATHER TO CHA
197         TRANSFER   ,TACC                              GO CHECK TAKE OFF
198   TERM  TERMINATE                                     TERMINATE TWIN
199   ERR   ASSIGN     XH$ERROR,101                       THIS STATE BOMBS MODEL
     *
     * TEST AND LOAD LANDING SCHEDULE
     *
200   AAA   LOGIC S    FINI5                              A/C IN TEST
201         TEST LE    M1,XH$MAXTM,AEDH                   HAS A/C WAITED TOO LONG
202         SAVEVALUE  ARCGO+,1,H                         A/C IN CONTROL
203         TEST GE    XH$ARCGO,MH$ARSEP(XH$ARSEP,11),AEA  CAN CONTROL HANDLE
204         LOGIC S    ARCGO                              DO NOT LET IN NEXT A/C
205         TRANSFER   ,AEA                               GO TO RUNWAY CHECK
206   ADI   GATE  LS   CHANG                              WAIT FCR WEATHER CHANGE
207         LOGIC R    CHANG                              RESET WEATHER CHANGE
208         UNLINK     HDARC,AEA,ALL,13,1                 CHECK ALL A/C WAITING
209         TRANSFER   ,ADI                               GO TO WAIT FOR CHANGE
     * DETERMINE LANDING RUNWAY
210   AEA   ASSIGN     1,XH$RUNWY                         STORE RUNWAYS
211         PRICRITY   0                                  DECREASE PRIORITY
212         ASSIGN     8,0                                INITIAL PARAMETER 8
213         ASSIGN     1+,1                               INCREMENT RUNWAYS BY 1
214         ASSIGN     1,MH$DSTN(P1,P2)                   STORE ARPRT MATRIX NUMB
215         TEST NE    P15,0,AEAA                         IS ARPRT PRIMARY
216         TEST G     P2,XH$HOLD,AEAA                    HAS ORIGIN CHANGED
217         ASSIGN     1,XH$RUNWY                         STORE RUNWAYS
218         ASSIGN     1+,1                               INCREMENT RUNWAYS BY 1
219         ASSIGN     1,MH$DSTN(P1,1)                    STORE HOLD AREA 1
220   AEAA  TEST  GE   V$CLOCK,MH*1(1,2),AEDD             IS ARPRT OPEN
221         TEST LE    V$CLOCK,MH*1(1,3),AEDD             IS ARPRT OPEN
222         ASSIGN     6,3                                STORE DAY TIME ROW
223         ASSIGN     7,MH*1(2,1)                        STORE MAX ROW
224         TEST GE    V$CLOCK,MH*1(2,2),AEB              IS IT DAY TIME
225         TEST G     V$CLOCK,MH*1(2,3),AED              IS IT DAY TIME
226   AEB   ASSIGN     6,MH*1(2,1)                        STORE NIGHT ROW
227         ASSIGN     7,MH*1(1,1)                        STORE MAX ROW
228         ASSIGN     7+,1                               INCREMENT MAX ROW
229   AED   TEST  G    XH$WNVEL,XH$CALM,AEF               IS WINC ABCVE MAX
230   AEDB- SAVEVALUE  DIRWN,XH$WNDIR,H                   STORE WIND DIRECTION
231         SAVEVALUE  DIRWN-,MH*1(P6,2),H                SUBTRACT RUNWAY HEADING
232         TEST L     XH$DIRWN,0,AEDBB                   IS IT NEGATIVE
233         SAVEVALUE  DIRWN,V$MDRWN,H                    MAKE IT POSITIVE
234   AEDBB TEST  GE   XH$DIRWN,180,AEDBC                 IS IT GREATER THAN 180
235         SAVEVALUE  DIRWN-,360,H                       SUBTRACRT 360
236   AEDBC TEST  G    V$DIRWN,6400,AEF                   IS RUNWAY IN 80 DEGREES
237   AEDA  ASSIGN     6+,1                               INCREMENT ROW COUNTER
238   *     TEST GE    P6,P7,AEDB                         IS ROW COUNTER AT MAX
239         TEST NE    P8,0,AEDD                          ANY OTHER RUNWY SELECTI
240         ASSIGN     15,MH*1(P8,1)                      STORE LANDING RUNWAY
241         TRANSFER   ,ADDC                              GO TO CHECK
242   AEDD  TEST  E    P15,0,AEDE                         IS A/C DESTINATION PRIM
243         PRIORITY   2                                  INCREASE PRIORITY
244         ASSIGN     15,RN5                             CHOOSE RANDOM NUMBER
245         TEST LE    P15,XH$DIVRT,AEDDD                 DIVERT A/C TO PRI ARPRT
246         TERMINATE                                      TERMINATE REMAINDER
247   AEDDD MSAVEVALUE DELAY+,3,P4,1,H                    STORE NUM DIVERTED
248         TRANSFER   ,ABC                               GO TO PRI ARPRT
249   AEDE  TEST  E    P13,0,AEDF                         IS A/C WAITING
250         SAVEVALUE  ARCGO-,1,H                         REMOVE A/C FM CONTROL
251         TEST LE    XH$ARCGO,MH$ARSEP(XH$ARSEP,11),AEDEE CAN A/C ENTER
252         LOGIC R    ARCGO                              CLEAR NEXT A/C
253   AEDEE GATE  LR   FINI1                              ALLOW 1 A/C IN TEST
254         UNLINK     1,TERM,1,10                        REMOVE TWIN FM LAND SCH
255         UNLINK     2,TERM,1,10                        REMOVE TWIN FM LAND SCH
256         SPLIT      1,AEDG                             CREATE TWIN
257         ASSIGN     13,1                               A/C IS WAITING
258   AEDF  LINK       HDARC,P10                          PUT BACK INTO HOLD
259   AEDG  ADVANCE    XH$MAXTM                           WAIT MAX TIME
260         UNLINK .   HDARC,TERM,1,10,,AEDH              REMOVE A/C FM HOLD AREA
261         MSAVEVALUE DELAY+,8,P4,1,H                    STORE NUM A/C CAN'T LAN
262         TERMINATE                                      TERMINATE A/C
263   AEDH  PRIORITY   0,BUFFER                           DECREASE PRIORITY
264         UNLINK     HDARC,TERM,1,10                    REMOVE A/C FM HOLD AREA
265         MSAVEVALUE DELAY+,8,P4,1,H                    STORE NUM A/C CAN'T LAN
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266            TERMINATE                                           TERMINATE A/C                    2886
267     AEF    TEST  NE    P8,0,AEFF                              WAS RUNWAY SELECTED              2887
268            SAVEVALUE   TESS,V$DIRWN                           STORE WIND DIRECTION             2888
269            SAVEVALUE   DIRWN,XH$WNDIR,H                       STORE WIND DIRECTION             2889
270            SAVEVALUE   DIRWN-,MH*1(P8,2),H                    SUBTRACT RUNWAY DIRECTI          2890
271            TEST L      XH$DIRWN,0,AEFD                        IS IT NEGATIVE                   2891
272            SAVEVALUE   DIRWN,V$MDRWN,H                        MAKE IT POSITIVE                 2892
273     AEFD   TEST  GE    XH$DIRWN,180,AEFB                      IS IT GREATER THAN 180           2893
274            SAVEVALUE   DIRWN-,360,H                           SUBTRACT 360                     2894
275     AEFB   SAVEVALUE   TESS-,V$DIRWN                          SUBTRACT WIND DIFFERENT          2895
276            TEST L      X$TESS,0,AEDA                          IS THIS RUNWAY CLOSER            2896
277     AEFF   TEST  NE    XH$VFRWT,1,ADD                         IS IT VFR                        2897
278            ASSIGN      16,0                                   INITIAL PARAMATER 16             2898
279            ASSIGN      12,MH*1(P6,3)                          STORE FACILITY MATRIX            2899
280     AEG    ASSIGN      16+,1                                  INCREMENT PARAMETER 16           2900
281            TEST LE     P16,MH*1(2,4),AEDA                     CHECK ALL APPROACHES             2901
282            ASSIGN      11,0                                   INITIAL COUNTER                  2902
283     AEH    ASSIGN      11+,1                                  INCREMENT COUNTER                2903
284            TEST LE     P11,4,AEK                              TEST ALL FACILITIES              2904
285            TEST NE     MH*12(P16,P11),0,AEH                   IS FACILITY ZERO                 2905
286            SAVEVALUE   DUMMY,MH*12(P16,P11),H                 DUMMY STORE                      2906
287            TEST NE     MX$FACIL(XH$DUMMY,1),1,AEH             IS FACILITY DOWN                 2907
288            TRANSFER    ,AEG                                   CHECK NEXT APPROACH              2908
289     AEK    SAVEVALUE   CEILT,XH$CEIL,H                        STORE CEILING                    2909
290            SAVEVALUE   VISAT,XH$VISAB,H                       STORE VISIBILITY                 2910
291            SAVEVALUE   CEILT-,MH*1(1,4),H                     SUBTRACT ARPRT ELEVATIO          2911
292            TEST NE     MH*12(P16,5),0,AEL                     IS OM REQUIRED                   2912
293            SAVEVALUE   DUMMY,MH*12(P16,5),H                   DUMMY STORER                     2913
294            TEST NE     MX$FACIL(XH$DUMMY,1),1,AEL             IS OM UP                         2914
295            SAVEVALUE   VISAT-,25,H                            UPDATE VISAB                     2915
296            SAVEVALUE   CEILT-,50,H                            UPDATE CEILING                   2916
297     AEL    TEST  NE    MH*12(P16,6),0,AEM                     IS MM REQUIRED                   2917
298            SAVEVALUE   DUMMY,MH*12(P16,6),H                   DUMMY STORER                     2918
299            TEST NE     MX$FACIL(XH$DUMMY,1),1,AEM             IS MM UP                         2919
300            SAVEVALUE   VISAT-,25,H                            UPDATE VISAB                     2920
301            SAVEVALUE   CEILT-,50,H                            UPDATE CEIL                      2921
302     AEM    TEST  NE    MH*12(P16,7),0,AEO                     IS ALS REQUIRED                  2922
303            SAVEVALUE   DUMMY,MH*12(P16,7),H                   DUMMY STORER                     2923
304            TEST NE     MX$FACIL(XH$DUMMY,1),1,AEO             IS ALS UP                        2924
305            SAVEVALUE   CEILT-,50,H                            UPDATE CEIL                      2925
306            SAVEVALUE   VISAT-,50,H                            UPDATE VISAB                     2926
307     AEO    TEST  NE    MH*12(P16,8),0,AEP                     IS HIRL REQUIRED                 2927
308            SAVEVALUE   DUMMY,MH*12(P16,8),H                   DUMMY STORER                     2928
309            TEST NE     MX$FACIL(XH$DUMMY,1),1,AEP              IS HIRL UP                      2929
310            SAVEVALUE   VISAT-,50,H                            UPDATE VISAB                     2930
311     AEP    ASSIGN      12,MH*1(P6,4)                          STORE MINMA TABLE                2931
312            SAVEVALUE   DUMMY,MH*1(P6,1),H                     DUMMY STORER                     2932
313            SAVEVALUE   TESS,MX*12(V$APPCT,XH$DUMMY)           DUMMY STORER                     2933
314            TEST NE     BV$WEATH,1,ADD                         IS WEATHER CK                    2934
315            ASSIGN      12,MH*1(P6,3)                          STORE RUNWAY SELECTED            2935
316            TRANSFER    ,AEG                                   CHECK NEXT APPROACH              2936
317     ADD    ASSIGN      12,0                                   INITIAL PARAMETER 12             2937
318            TEST E      P15,0,ADDA                             IS A/C DESTINATION PRIM          2938
319            TERMINATE                                           TERMINATE SECONDARY AC          2939
320     ADDA   ASSIGN      15,MH*1(P6,1)                          STORE RUNWAY SELECTED            2940
321            TEST G      XH$WNVEL,XH$WNMAX,ADDC                 IS WIND MAXIMUM                  2941
322            ASSIGN      8,P6                                   STORE RUNWAY SELECTED            2942
323            TRANSFER    ,AEDA                                  GO CHECK FOR CLOSER RUN          2943
324     ADDC   ASSIGN      1,0                                    INITIAL PARAMETER 1              2944
325            TEST E      P13,1,ADDB                             IS A/C IN HOLD                   2945
326            ASSIGN      13,0                                   A/C CLEARED TO LAND              2946
327            PRIORITY    2                                      INCREASE PRIORITY                2947
328            LOGIC S     ENTER                                  A/C IN HOLD AREA                 2948
329            LINK        HDARC,P10                              PUT A/C INTO HOLD                2949
330     ADDB   TEST  E     P9,1,ADE                               IS AIR WEIGHT CLASS 1            2950
331            TEST E      XH$VFRWT,1,ADE                         IS IT VFR                        2951
332            ASSIGN      11,2                                   USE SECONDARY RUNWAY             2952
333            ASSIGN      7,XH$TOF                               STORE AVERAGE TOF                2953
334            TRANSFER    ,ADF                                   GO TO CALC ETA                   2954
335     ADE    ASSIGN      11,1                                   USE PRIMARY RUNWAY               2955
336            MSAVEVALUE  VFRAC,V$CLOCK,19,P15,H                                                  2956
337            TEST GE     XH$ARSEP,XH$NORAD,ADEE                 IS RADAR UP                      2957
338            ASSIGN      7,V$TOFNR                              CALC TOF NON RADAR               2958
339            TRANSFER    ,ADF                                   GO TO CALC ETA                   2959
340     ADEE   ASSIGN      7,V$TOF                                ASSIGN TIME OF FLIGHT            2960
       * CALCULATE ETA AND CONFLICTS                                                               2961
341     ADF    ASSIGN      6,P7                                   RECORD TIME OF FLIGHT            2962
342            ASSIGN      8,0                                                                     2963
343            TEST G      P2,XH$HOLD,ADG                         IS A/C DIVERTED                  2964
344            MSAVEVALUE  DELAY+,4,P4,P7,H                       STORE TOF FM SEC ARPRT           2965
345     ADG    ASSIGN      6+,C1                                  ASSIGN EST TIME OF ARIV          2966
346     BBB    GATE  LR    FINI1                                  ALLOW 1 A/C IN TEST              2967
347            LOGIC S     FINI1                                  A/C IN TEST                      2968
348            UNLINK      1,TERM,1,10                            REMOVE A/C FM LAND SCHE          2969
349            UNLINK      2,TERM,1,10                            REMOVE A/C FM LAND SCHE          2970
350            SAVEVALUE   TMCTR,P6                               STORE ETA                        2971
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351   BBBB  UNLINK     P11,BBD,ALL,BV$LEDAC,,BBI         FETCH LEAD A/C'S
352         GATE LS    FINI4                             WAIT FOR CALC COMPLETE
353   BBA   LOGIC R    FINI4                             RESET SWITCH
354         UNLINK     P11,BBC,1,BV$TRLAC,,BBJ           FETCH TRAIL A/C
355   BBAA  GATE  LS   FINI3                             WAIT FOR CALC COMPLETE
356         LOGIC R    FINI3                             RESET SWITCH
357         LOGIC R    FINI1                             A/C OUT OF TEST
358         TEST E     X$TRLTM,0,CCC                     DOES TRAIL A/C EXIST
      * TRAILING A/C DOES NOT EXIST
359         TEST NE    X$LEDTM,0,BBF                     DOES LEAD A/C EXIST
      * LEAD A/C EXISTS
360   BBAD  ASSIGN     1,0                               INITIAL PARAMETER 1
361         TEST LE    P9,XH$LEDWT,BBAC                  IS LEAD A/C SMALLER
362         TEST E     XH$LEDWT,3,BBAB                   IS LEAD A/C WEIGHT 3
363         ASSIGN     1,6                               ASSIGN 6 TC PARAMETER 1
364         ASSIGN     1+,XH$LEDWT                       ADD LEAD A/C WEIGHT
365         ASSIGN     1-,P9                             SUBTRACT A/C WEIGHT
366         ASSIGN     1,MH$ARSEP(XH$ARSEP,P1)           DETERMINE ADD SEPARTION
367         TRANSFER   ,BBAC                             GO TO CALC TOTAL SEPARA
368   BBAB  TEST  E    XH$LEDWT,2,BBAC                   IS LEAD A/C WEIGHT 2
369         ASSIGN     1,9                               ASSIGN 9 TC PARAMETER 1
370         ASSIGN     1+,XH$LEDWT                       ADD LEAD A/C WEIGHT
371         ASSIGN     1-,P9                             SUBTRACT A/C WEIGHT
372         ASSIGN     1,MH$ARSEP(XH$ARSEP,P1)           DETERMINE ADD SEPARATIO
373   BBAC  ASSIGN     1+,MH$ARSEP(XH$ARSEP,5)           DETERMINE TOTAL SEPARAT
374         TEST L     P1,XH$LNDST,BBAE                  IS LAND SEPAR OK
375         TEST G     CH$TAKOF,XH$TAKQU,BBAE            IS TAKE OFF QUEUE FULL
376         ASSIGN     1,XH$LNDST                        INCREASE SEPARATION
377   BBAE  ASSIGN     1,V$ARSEP                         CONVERT SEPAR TO TIME
378         ASSIGN     1+,X$LEDTM                        ADD SEPAR TO LEAD A/C
379         TEST NE    P12,1,CDE                         DOES TRAILING A/C EXIST
380         TEST G     P1,P6,BBF                         IS PROPER SEPAR OBSERVE
      * CALCULATE WAIT TIME
381         ASSIGN     1-,P6                             ASSIGN WAIT TIME
382         ASSIGN     6+,P1                             CALCULATE TA
383         ASSIGN     8+,P1                             STORE WAIT TIME
384   BBF   SPLIT      1,BBE                             SEND TWIN TO LAND SCHED
385         LINK       P11,P6                            A/C IN LANC SCHEDULE
386   BBE   TEST  G    P8,0,AAB                          ANY WAIT TIME
387         TEST G     P8,XH$MAXTM,BBEE                  WILL A/C WAIT TOO LONG
388         GATE LR    FINI1                             WAIT FOR TRANSACTIONS
389         UNLINK     P11,TERM,1,5,,ERR                 REMOVE TWIN FM LAND SCH
390         SAVEVALUE  ARCGO-,1,H                        REMOVE A/C FM CONTROL
391         TRANSFER   ,AEDH                             RECORD A/C
392   BBEE  ADVANCE    P8                                WAIT WAIT TIME
393         MSAVEVALUE DELAY+,7,P4,P8,H                  STORE WAIT TIME
394         PRIORITY   2                                 INCREASE PRIORITY
395         ASSIGN     8,0                               ZERO WAIT TIME
396         TEST G     XH$ARCGO,MH$ARSEP(XH$ARSEP,11),AEA  CAN AIR CONTROL
397         SAVEVALUE  ARCGO-,1,H                        A/C NOT IN AIR CONTROL
398         GATE LR    FINI1                             WAIT FOR TRANSACTIONS
399         UNLINK     P11,TERM,1,5,,ERR                 REMOVE A/C FM LAND SCH
400         LINK       HDARC,P10                         LOAD A/C INTO HOLD AREA
401   BBC   SAVEVALUE  TRLTM,P6                          STORE TRAIL A/C TA
402         SAVEVALUE  TRLWT,P9,H                        STORE TRAIL A/C WEIGHT
403         SAVEVALUE  TRLVL,P3,H                        STORE TRL A/C SPEED
404         LOGIC S    FINI3                             CALCULATIONS COMPLETED
405         LINK       P11,P6                            A/C IN LANC SCHEDULE
406   BBJ   SAVEVALUE  TRLTM,0                           ZERO TRAIL A/C TA
407         SAVEVALUE  TRLWT,0,H                         ZERO TRAIL A/C WEIGHT
408         SAVEVALUE  TRLVL,0,H                         ZERO TRAIL A/C SPEED
409         LOGIC S    FINI3                             CALCULATIONS COMPLETE
410         TRANSFER   ,BBAA                             GO TO CONTINUE TEST
411   BBD   SAVEVALUE  LEDTM,P6                          STORE LEAD A/C TA
412         SAVEVALUE  LEDWT,P9,H                        STORE LEAD A/C WEIGHT
413         TEST E     W$BBBB,1,BBDD                     RETURN ALL A/C INTO HOL
414         LOGIC S    FINI4                             CALCULATIONS COMPLETE
415   BBDD  LINK       P11,P6                            A/C IN LANDING SCHEDULE
416   BBI   SAVEVALUE  LEDTM,0                           ZERO LEAD A/C TA
417         SAVEVALUE  LEDWT,0,H                         ZERO LEAD A/C WEIGHT
418         TRANSFER   ,BBA                              GO TO TRAIL A/C CALC
      *
      * TRAILING A/C EXISTS
      *
419   CCC   TEST  E    X$LEDTM,0,CDD                     DOES LEAD A/C EXIST
      * TEST TRAILING A/C
420   CCD   ASSIGN     1,0                               INITIAL PARAMETER 1
421         TEST L     P6,X$TRLTM,BBB                  IS TLR TIME VALID
422         TEST LE    XH$TRLWT,P9,CCF                   IS TRAILING A/C SMALLER
423         TEST E     P9,3,CCE                          IS LEAD A/C WEIGHT 3
424         ASSIGN     1,6                               ASSIGN 6 TC PARAMETER 1
425         ASSIGN     1+,P9                             ADD LEAD A/C WEIGHT
426         ASSIGN     1-,XH$TRLWT                       SUB TRAIL A/C WEIGHT
427         ASSIGN     1,MH$ARSEP(XH$ARSEP,P1)           DETERMINE ADD SEPARATIO
428         TRANSFER   ,CCF                              GO TO CALC TOTAL SEPARA
429   CCE   TEST  E    P9,2,CCF                          IS LEAD A/C WEIGHT 2
```

(continued)

```
430            ASSIGN     1,9                              ASSIGN 9 TO PARAMETER 1
431            ASSIGN     1+,P9                            ADD LEAD A/C WEIGHT
432            ASSIGN     1-,XH$TRLWT                      SUBTRACT TRAIL A/C WEIG
433            ASSIGN     1,MH$ARSEP(XH$ARSEP,P1)          DETERMINE ADD SEPARATIO
434      CCF   ASSIGN     1+,MH$ARSEP(XH$ARSEP,5)          DETERMINE TOTAL SEPARAT
435            TEST L     P1,XH$LNDST,CCG                  IS LAND SEPAR OK
436            TEST G     CH$TAKOF,XH$TAKQU,CCG            IS TAKE OFF QUEUE FULL
437            ASSIGN     1,XH$LNDST                       INCREASE SEPARATION
438      CCG   ASSIGN     1,V$SEPAR                        CONVERT SEPAR TO TIME
439            ASSIGN     1+,P6                            ADD SEPAR TO ETA
440            TEST G     P1,X$TRLTM,BBF                   IS SEPAR OBSERVED
         * CALCULATE WAIT TIME
441            ASSIGN     8+,X$TRLTM                       ADD TRAIL A/C TA
442            ASSIGN     8-,P6                            SUB ETA
443            ASSIGN     6,X$TRLTM                        REINTIALIZE ETA
444            TRANSFER   ,BBB                             GO TO TEST
         * LEAD A/C EXISTS
445      CDD   ASSIGN     12,1                             LOAD DUMMY COUNTER
446            TRANSFER   ,BBAD                            GO TO DETERMINE SEPARAT
447      CDE   ASSIGN     12,0                             REINITIALIZE PARAMETER
448            SAVEVALUE  LEDWT,0,H                        ZERO LEAD A/C WEIGHT
449            SAVEVALUE  LEDTM,0                          ZERO LEAD A/C TA
450            TEST G     P1,P6,CCD                        IS SEPAR OBSERVED
         * CALCULATE WAIT TIME
451            ASSIGN     1-,P6                            ASSIGN WAIT TIME
452            ASSIGN     6+,P1                            CALCULATE TA
453            ASSIGN     8+,P1                            STORE WAIT TIME
454            TRANSFER   ,CCD                             GO TO TRAIL A/C TEST
         *
         * FACILITIES OUTAGE MODULE
         *
455            GENERATE   ,,,1,,4,F                        CREATE FACIL XACT
456      DAA   ASSIGN     2+,1                             INCREMENT COUNTER
457            TEST G     P2,XH$FACIL,DAB                  ARE ALL FACIL CREATED
458            LOGIC S    FINI6                            ALL FACIL CREATED
459            SAVEVALUE  ARSEP,1,H                        RADAR ENVIRONMENT
460      DAAA  GATE LS    FCHAN                            WAIT FOR FACIL DOWN
461            LOGIC R    FCHAN                            RESET SWITCH
462            SAVEVALUE  ARSEP,0,H                        INITIAL POINTER
463      DAAB  SAVEVALUE  ARSEP+,1,H                       INCREMENT POINTER
464            TEST L     XH$ARSEP,XH$RADDW,DAAA           CHECK ALL FACILITIES
465            ASSIGN     1,0                              INITIAL PARAMETER 1
466      DAAC  ASSIGN     1+,1                             INCREMENT PARAMETER 1
467            TEST LE    P1,4,DAAA                        CHECK ALL FACILITIES
468            ASSIGN     2,MH$ARSEP(XH$ARSEP,P1)          STORE FACILITY NUMBER
469            TEST NE    P2,0,DAAC                        IS FACILITY REQUIRED
470            TEST E     MX$FACIL(P2,1),0,DAAC            IS FACILITY UP
471            TRANSFER   ,DAAB                            CHECK NEXT CONDITION
472      DAB   SPLIT      1,DAA                            CREATE NEXT FACILITY
473            ASSIGN     3,MX$FACIL(P2,2)                 STORE MTBF
474            ASSIGN     4,MX$FACIL(P2,3)                 STORE MTTR
475      DAC   MSAVEVALUE FACIL,P2,1,1                     FACIL IS UP
476            ASSIGN     1,RN4                            GET RANDOM NUMBER
477            ADVANCE    V$MTBF                           WAIT FOR FACILITY DOWN
478            LOGIC S    FCHAN                            FACILITY HAS CHANGED
479            MSAVEVALUE FACIL,P2,1,0                     RECORD FACIL DOWN
480            ASSIGN     1,RN4                            GET RANDOM NUMBER
481            ADVANCE    V$MTTR                           REPAIR FACIL
482            LOGIC S    CHANG                            FACILITY DOWN
483            LOGIC S    FCHAN                            FACILITY DOWN
484            TRANSFER   ,DAC                             GO TO MTBF CALC
         *
         * MODEL RUN CONSTRAINTS
         *
485            GENERATE   1440,,,,,1                       SIMULATE 1440 MINUTES
486            TERMINATE  1
               START      1,,,1
               END
```

BLOCK NUMBER	SYMBOL	REFERENCES BY CARD NUMBER				
200	AAA	2683				
132	AAB	3010				
148	AABA	2759				
79	AABF	2683				
81	AABG	2686				
103	AAD	2712				
107	AAG	2711				
110	ABA	2719				
115	ABB	2724				
122	ABC	2868				
96	ACC	2705				
100	ACD	2703	2704			
317	ADD	2897	2934			
320	ADDA	2938				
330	ADDB	2945				
324	ADDC	2861	29[illegible]1			
335	ADE	2950	29[illegible]			
340	ADEE	2957				
341	ADF	2954	2959			
345	ADG	2964				
206	ADI	2677	[illegible]328			
210	AEA	2731	2822	[illegible]824	2827	3020
220	AEAA	2835	2836			
226	AEB	2844				
229	AED	2845				
237	AECA	2896	2901	2943		
230	AEDB	2858				
234	AEDBB	2852				
236	AEDBC	2854				
242	AEDD	2840	2841	2859		
247	AEDDD	2865				
249	AEDE	2862				
253	AEDEE	2871				
258	AEDF	2869				
259	AEDG	2876				
263	AEDH	2820	2880	3015		
267	AEF	2849	2856			
275	AEFB	2893				
273	AEFD	2891				
277	AEFF	2887				
280	AEG	2908	2936			
283	AEH	2905	2907			
289	AEK	2904				
297	AEL	2912	2914			
302	AEM	2917	2919			
307	AEO	2922	2924			
311	AEP	2927	2929			
353	BBA	3042				
355	BBAA	3034				
368	BBAB	2985				
373	BBAC	2984	2990	2991		
360	BBAD	3076				
377	BBAE	2997	2998			
346	BBB	3049	3073			
351	BBBB	3037				
401	BBC	2975				
411	BBD	2972				
415	BBDD	3037				
386	BBE	3008				
392	BBEE	3011				
384	BBF	2981	3003	3068		
416	BBI	2972				
406	BBJ	2975				
419	CCC	2979				
420	CCD	3080	3085			
429	CCE	3051				
434	CCF	3050	3056	3057		
438	CCG	3063	3064			
445	CDD	3046				
447	CDE	3002				
456	DAA	3106				
460	DAAA	3098	3101			
463	DAAB	3105				
466	DAAC	3103	3104			
472	DAB	3091				
475	DAC	3118				
199	ERR	2747	2803	3013	3023	
138	NDLY	2748				
196	NOTAK	2801	2802			
150	TAA	2756				
159	TAB	2773				
171	TACA	2785				

(continued)

161	TACC	2791	2813					
169	TACD	2800						
176	TAD	2780						
191	TAE	2805						
195	TAF	2808						
185	TAKOF	2787	2788					
180	TBKOF	2780						
198	TERM	2747	2803	2874	2875	2880	2884	2969
		2970	3013	3023				
141	TERM1	2752						
4	WTA	2655						
11	WTB	2604	2605					
12	WTC	2610						
59	WTCL	2599	2665					
64	WTCLA	2658						
65	WTCLB	2660						
66	WTCLL	2657						
16	WTD	2615						
19	WTE	2614						
25	WTF	2624						
28	WTG	2623						
32	WTGG	2626						
35	WTGGA	2629						
36	WTGGG	2628	2631					
41	WTH	2640						
44	WTI	2639						
48	WTJ	2642						
49	WTJJ	2644						
55	WTK	2648	2649					
69	WTVS	2600	2672					
72	WTVSS	2667						

SAVEVALUE SYMBOLS

5 LEDTM - Dummy counter used to store lead aircraft landing time
1 LNDTM - Dummy counter used to store approach aircraft landing time
3 TESS - Dummy counter used to store wind direction
2 TMCTR - Dummy counter used to store aircraft landing time
4 TRLTM - Dummy counter used to store trailing aircraft landing time

VARIABLE SYMBOLS

29 APPCT - Dummy variable used to store row number of minima matrix based on aircraft category
24 ARSEP - Variable used to calculate separation between lead aircraft and aircraft of interest
7 CEIL - Variable used to modify ceiling ±50 feet
2 CEILO - Variable used to modify ceiling ±150 feet
27 CEILT - Variable used to convert minima matrix entry into feet of ceiling
1 CLOCK - Variable which converts the computer clock time into simulated hour in the day
19 DELAY - Variable used to determine if an aircraft has experienced any delay
13 DELTM
15 DELT1 - Variables used to determine elapsed time between aircraft arrivals
14 DELT2
11 DESTN
12 DEST1 - Variables used to determine aircraft destination
20 DIRWN - Dummy variable used to square difference between wind direction and runway direction
23 LNDSP - Variable used to calculate the approaching aircraft distance from touch down
26 MDRWN - Dummy variable used to change the sign of the wind direction off the runway direction
21 MOD - Variable used to calculate the turnaround time of a landing aircraft
3 MTBF - Variable used to determine the minutes until next failure for a facility
4 MTTR - Variable used to determine the minutes required to repair a downed facility
25 SEPAR - Variable used to calculate separation between aircraft of interest and trailing aircraft
22 SPRED - Variable used to put a spread on the variable MOD
18 TAKDY - Variable used to determine if an aircraft experienced any delay during takeoff
16 TOF - Variable used to calculate the time of flight of an aircraft in a radar environment
17 TOFNR - Variable used to calculate the time of flight of an aircraft in a non-radar environment
9 TYPEA
10 TYPED - Variables used to assign an aircraft type based on the aircraft destination
5 VISAB - Variable used to vary the visibility ±.25 mile
28 VISAT - Variable used to convert minima matrix entry into miles of visibility
8 WTCHG - Variable used to determine the number of minutes until the next major weather change
6 WTVAR - Variable used to determine the number of minutes until the next minor weather variation

LOGIC SWITCH SYMBOLS

ARCGO - Logic switch is set when air control can accept aircraft
CHANG - Logic switch is set when there is a change in facility status or weather
CLRO - Logic switch is set when aircraft is allowed to take off
ENTER - Logic switch is set when an aircraft is in the hold area
FCHAN - Logic switch is set when there is a change in facility status
FINI1 - Logic switch which allows only one transaction to examine the landing schedule at a time
FINI2 - Logic switch prevents next generated aircraft into the system until previous aircraft is in the system
FINI3 - Logic switch used to hold an aircraft transaction until trail aircraft statistics are gathered
FINI4 - Logic switch used to hold an aircraft transaction until lead aircraft statistics are gathered
FINI5 - Logic switch used to allow aircraft into the landing schedule before air control checks next aircraft
FINI6 - Logic switch prevents generation of aircraft until all facilities are created
LNDSP - Logic switch prevents aircraft takeoff on land runway until landing aircraft has cleared
TAKOF - Logic switch is set when proper separation is experienced between taking off aircraft

CHAIN SYMBOLS AND CORRESPONDING NUMBERS

3 HDARC - Hold area chain
1 LDSCD - Landing schedule chain (1 - primary runway, 2 - secondary runway)
4 TAKOF - Departure chain

FUNCTION SYMBOLS AND CORRESPONDING NUMBERS

7 CEIL - Function converts column number to ceiling in feet
11 LOGRN - Function converts random number into a logarithm of the random number
10 MODSP - Function defines the modifier and spread of aircraft turnaround time
5 PMFTY - Function randomly chooses between 50 and 150
9 PMOFY - Function randomly chooses between 150 and 300
1 SPEED - Function defines speed of aircraft based on aircraft type
8 VISAB - Function converts column number to visibility in miles
6 WNVEL - Function converts column number to wind velocity

MATRIX SAVEVALUE SYMBOLS AND CORRESPONDING NUMBERS

15 FACIL - Facility matrix
1 MINMA - Minimum matrixes for each airport (1-14)

HALF WORD MATRIX SAVEVALUE SYMBOLS AND CORRESPONDING NUMBERS

101 AIR01
106 AIR02 - Matrixes used to define airports, facilities required, and approaches
133 AIR03
43 ARSEP - Separation matrix
40 CATWT - Matrix used to determine category and weight of created aircraft
44 DELAY - Matrix used to total delays
1 DIRVL - Matrix used to determine weather conditions
36 DSTN - Matrix used to determine the distances from secondary airports and hold areas to Logan runways
37 DSTNR - Same as above except in a non-radar environment
39 IFRAC - Matrix used to determine aircraft generated and destination under IFR conditions
42 IFRPT - Matrix used to determine aircraft type based on destination under IFR conditions
38 VFRAC
41 VFRPT - Same as above except under VFR conditions

BOOLEAN VARIABLE SYMBOLS AND CORRESPONDING NUMBERS

1	CLRD	- Boolean variable used to find approaching aircraft
3	LEDAC	- Boolean variable used to find lead aircraft
2	TRLAC	- Boolean variable used to find trailing aircraft
4	WEATH	- Boolean variable used to determine if weather is below minimum for approach in question

**** ASSEMBLY TIME = 14.35 MINUTES ****

HALF WORD SAVEVALUE SYMBOLS

ACCTR - Accumulator used to count aircraft going to Logan
ACNUM - Counts aircraft created
AIRPT - Number of holding fixes and secondary airports
ARCGO - Counter used to count number of aircraft under air control
ARSEP - Pointer used to determine which row of the separation matrix is in use
CALM - Maximum wind speed for calm
CEIL - Present ceiling in feet
CEILP - Present ceiling column number
CEILT - Dummy counter used to manipulate the ceiling
DAYEN - End of day, time, for weather determination
DAYST - Start of day, time, for weather determination
DIRWN - Dummy counter used to manipulate the wind direction and runway direction
DIVRT - Number, out of 1000 aircraft, that divert to Logan from secondary airport
ERROR - Dummy counter used to bomb model if an impossible situation exists
FACIL - Number of facilities modeled
HOLD - Number of Logan holding fixes
IFRWT - Dummy counter is equal to zero in VFR and one in IFR conditions
LEDWT - Dummy counter used to store the lead aircraft's weight
LNDSP - Separation in miles between landing and taking off aircraft
LNDST - Separation increase if takeoff queue is greater than TAKQU
LNDVL - Dummy counter used to store the approach aircraft's landing velocity
MAXTM - Maximum holding time
MNONE - Dummy input
NORAD - Row number in the separation matrix where no radar condition exists
RADDW - Last row in separation matrix
RUNWY - the number of runways at Logan
TAKCL - Maximum takoff ceiling
TAKOF - Departing aircraft counter
TAKQU - Maximum number of aircraft in takeoff queue before landing separation increases
TAKVS - Minimum takeoff visibility
TOF - Time flight from holding fix or secondary airport to Logan
TRLVL - Dummy counter used to store trailing aircraft velocity
TRLWT - Dummy counter used to store trailing aircraft weight
TYPCT - Dummy counter used in the generation of aircraft
VFRWT - Dummy counter is equal to zero in IFR and one in VFR conditions
VISAB - Present visibility in miles
VISAP - Present visibility in column number
VISAT - Dummy counter used to manipulate the visibility
WNDIR - Present wind direction in degrees
WNMAX - Wind speed above which aircraft land on runway closest to the wind.
WNVEL - Present wind velocity
WTCHG - Mean time between major weather change
WTVAR - Mean time between minor weather change

Assembly of Program

```
         SIMULATE    30
1        MATRIX      H     18     13
2        MATRIX      H     6      10
4        MATRIX      H     6      10
6        MATRIX      H     6      10
8        MATRIX      H     6      10
10       MATRIX      H     6      10
12       MATRIX      H     6      10
14       MATRIX      H     6      10
16       MATRIX      H     6      10
18       MATRIX      H     6      10
20       MATRIX      H     6      10
22       MATRIX      H     6      10
24       MATRIX      H     6      10
26       MATRIX      H     6      10
28       MATRIX      H     6      10
30       MATRIX      H     6      10
32       MATRIX      H     6      10
34       MATRIX      H     6      10
3        MATRIX      H     6      14
5        MATRIX      H     6      14
7        MATRIX      H     6      14
9        MATRIX      H     6      14
11       MATRIX      H     6      14
13       MATRIX      H     6      14
15       MATRIX      H     6      14
17       MATRIX      H     6      14
19       MATRIX      H     6      14
21       MATRIX      H     6      14
23       MATRIX      H     6      14
25       MATRIX      H     6      14
27       MATRIX      H     6      14
29       MATRIX      H     6      14
31       MATRIX      H     6      14
33       MATRIX      H     6      14
35       MATRIX      H     6      14
158      MATRIX      H     2      8
157      MATRIX      H     2      8
111      MATRIX      H     4      4
112      MATRIX      H     4      4
113      MATRIX      H     4      4
117      MATRIX      H     4      4
118      MATRIX      H     6      4
106      MATRIX      H     6      4
107      MATRIX      H     6      4
109      MATRIX      H     6      4
110      MATRIX      H     6      4
114      MATRIX      H     6      4
115      MATRIX      H     6      4
116      MATRIX      H     6      4
108      MATRIX      H     5      4
101      MATRIX      H     18     4
148      MATRIX      H     2      8
149      MATRIX      H     1      8
150      MATRIX      H     1      8
151      MATRIX      H     4      8
152      MATRIX      H     1      8
153      MATRIX      H     3      8
159      MATRIX      H     3      8
160      MATRIX      H     3      8
161      MATRIX      H     3      8
154      MATRIX      H     3      8
155      MATRIX      H     2      8
133      MATRIX      H     7      8
134      MATRIX      H     7      8
135      MATRIX      H     7      8
136      MATRIX      H     7      8
137      MATRIX      H     7      8
138      MATRIX      H     7      8
139      MATRIX      H     7      8
140      MATRIX      H     7      8
141      MATRIX      H     7      8
142      MATRIX      H     7      8
143      MATRIX      H     5      8
156      MATRIX      H     5      8
144      MATRIX      H     4      8
145      MATRIX      H     1      8
146      MATRIX      H     1      8
147      MATRIX      H     2      8
36       MATRIX      H     6      18
37       MATRIX      H     5      18
38       MATRIX      H     24     19
39       MATRIX      H     24     18
40       MATRIX      H     4      7
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41   MATRIX   H   18   3
42   MATRIX   H   18   3
43   MATRIX   H   16   11
44   MATRIX   H   13   4
15   MATRIX   X   63   3
1    MATRIX   X   28   5
2    MATRIX   X   20   4
3    MATRIX   X   16   4
4    MATRIX   X   4    4
5    MATRIX   X   4    4
6    MATRIX   X   8    4
7    MATRIX   X   8    2
8    MATRIX   X   4    2
9    MATRIX   X   4    2
10   MATRIX   X   16   4
11   MATRIX   X   4    4
12   MATRIX   X   12   4
13   MATRIX   X   12   2
14   MATRIX   X   8    4
     INITIAL  MX15(1-4,2),60300
     INITIAL  MX15(1-4,3),318
     INITIAL  MX15(5,2),72300
     INITIAL  MX15(5,3),402
     INITIAL  MX15(6-7,2),24600
     INITIAL  MX15(6-7,3),534
     INITIAL  MX15(8-11,2),28500
     INITIAL  MX15(8-11,3),1260
     INITIAL  MX15(12-16,2),23400
     INITIAL  MX15(12-16,3),900
     INITIAL  MX15(17-20,2),111900
     INITIAL  MX15(17-20,3),1920
     INITIAL  MX15(21-24,2),130500
     INITIAL  MX15(21-24,3),2580
     INITIAL  MX15(25-35,2),2100000
     INITIAL  MX15(25-35,3),660
     INITIAL  MX15(36,2),24600
     INITIAL  MX15(36,3),534
     INITIAL  MX15(37,2),36300
     INITIAL  MX15(37,3),96
     INITIAL  MX15(38,2),5160
     INITIAL  MX15(38,3),180
     INITIAL  MX15(39,2),29100
     INITIAL  MX15(39,3),120
     INITIAL  MX15(40,2),20100
     INITIAL  MX15(40,3),114
     INITIAL  MX15(41-48,2),25200
     INITIAL  MX15(49-50,2),2100000
     INITIAL  MX15(54-55,2),25200
     INITIAL  MX15(58-61,2),25200
     INITIAL  MX15(63,2),25200
     INITIAL  MX15(41-48,3),780
     INITIAL  MX15(49-50,3),616
     INITIAL  MX15(54-55,3),780
     INITIAL  MX15(58-61,3),780
     INITIAL  MX15(63,3),780
     INITIAL  MX15(51-53,2),2100000
     INITIAL  MX15(51-53,3),660
     INITIAL  MX15(56-57,2),25200
     INITIAL  MX15(56-57,3),780
     INITIAL  MX15(62,2),25200
     INITIAL  MX15(62,3),780
     INITIAL  MH36(1,1),34
     INITIAL  MH36(1,2),25
     INITIAL  MH36(1,3),19
     INITIAL  MH36(1,4),31
     INITIAL  MH36(1,5),49
     INITIAL  MH36(1,6),27
     INITIAL  MH36(1,7),36
     INITIAL  MH36(1,8),46
     INITIAL  MH36(1,9),39
     INITIAL  MH36(1,10),46
     INITIAL  MH36(1,11),22
     INITIAL  MH36(1,12),29
     INITIAL  MH36(1,13),55
     INITIAL  MH36(1,14),12
     INITIAL  MH36(1,15),33
     INITIAL  MH36(1,16),14
     INITIAL  MH36(1,17),30
     INITIAL  MH36(1,18),38
     INITIAL  MH36(2,1),39
     INITIAL  MH36(2,2),45
     INITIAL  MH36(2,3),41
     INITIAL  MH36(2,4),18
     INITIAL  MH36(2,5),33
     INITIAL  MH36(2,6),16
     INITIAL  MH36(2,7),22
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(continued)

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INITIAL    MH36(2,8),37
INITIAL    MH36(2,9),31
INITIAL    MH36(2,10),25
INITIAL    MH36(2,11),22
INITIAL    MH36(2,12),29
INITIAL    MH36(2,13),34
INITIAL    MH36(2,14),12
INITIAL    MH36(2,15),33
INITIAL    MH36(2,16),14
INITIAL    MH36(2,17),30
INITIAL    MH36(2,18),38
INITIAL    MH36(3,1),33
INITIAL    MH36(3,2),45
INITIAL    MH36(3,3),41
INITIAL    MH36(3,4),20
INITIAL    MH36(3,5),26
INITIAL    MH36(3,6),26
INITIAL    MH36(3,7),16
INITIAL    MH36(3,8),38
INITIAL    MH36(3,9),43
INITIAL    MH36(3,10),23
INITIAL    MH36(3,11),47
INITIAL    MH36(3,12),36
INITIAL    MH36(3,13),28
INITIAL    MH36(3,14),43
INITIAL    MH36(3,15),45
INITIAL    MH36(3,16),35
INITIAL    MH36(3,17),49
INITIAL    MH36(3,18),24
INITIAL    MH36(4,1),50
INITIAL    MH36(4,2),29
INITIAL    MH36(4,3),25
INITIAL    MH36(4,4),20
INITIAL    MH36(4,5),44
INITIAL    MH36(4,6),43
INITIAL    MH36(4,7),35
INITIAL    MH36(4,8),68
INITIAL    MH36(4,9),63
INITIAL    MH36(4,10),43
INITIAL    MH36(4,11),29
INITIAL    MH36(4,12),20
INITIAL    MH36(4,13),40
INITIAL    MH36(4,14),26
INITIAL    MH36(4,15),29
INITIAL    MH36(4,16),30
INITIAL    MH36(4,17),32
INITIAL    MH36(4,18),49
INITIAL    MH36(5,1),25
INITIAL    MH36(5,2),32
INITIAL    MH36(5,3),47
INITIAL    MH36(5,4),41
INITIAL    MH36(5,5),26
INITIAL    MH36(5,6),16
INITIAL    MH36(5,7),22
INITIAL    MH36(5,8),37
INITIAL    MH36(5,9),31
INITIAL    MH36(5,10),25
INITIAL    MH36(5,11),36
INITIAL    MH36(5,12),51
INITIAL    MH36(5,13),34
INITIAL    MH36(5,14),34
INITIAL    MH36(5,15),55
INITIAL    MH36(5,16),35
INITIAL    MH36(5,17),52
INITIAL    MH36(5,18),17
INITIAL    MH36(6,1-5),101
INITIAL    MH36(6,6),106
INITIAL    MH36(6,7),107
INITIAL    MH36(6,8),108
INITIAL    MH36(6,9),109
INITIAL    MH36(6,10),110
INITIAL    MH36(6,11),111
INITIAL    MH36(6,12),112
INITIAL    MH36(6,13),113
INITIAL    MH36(6,14),114
INITIAL    MH36(6,15),115
INITIAL    MH36(6,16),116
INITIAL    MH36(6,17),117
INITIAL    MH36(6,18),118
INITIAL    MH37(1,1),26
INITIAL    MH37(1,2),49
INITIAL    MH37(1,3),39
INITIAL    MH37(1,4),55
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INITIAL    MH37(1,6),15
INITIAL    MH37(1,7),14
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INITIAL    MH37(1,14),28
INITIAL    MH37(1,15),31
INITIAL    MH37(1,16),28
INITIAL    MH37(1,17),45
INITIAL    MH37(1,18),24
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INITIAL    MH37(2,2-3),39
INITIAL    MH37(2,4),38
INITIAL    MH37(2,5),36
INITIAL    MH37(2,6),38
INITIAL    MH37(2,7),21
INITIAL    MH37(2,8),62
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INITIAL    MH37(2,10),38
INITIAL    MH37(2,11),45
INITIAL    MH37(2,12),31
INITIAL    MH37(2,13),35
INITIAL    MH37(2,14),38
INITIAL    MH37(2,15),42
INITIAL    MH37(2,16),28
INITIAL    MH37(2,17),45
INITIAL    MH37(2,18),35
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INITIAL    MH37(3,2),38
INITIAL    MH37(3,3),46
INITIAL    MH37(3,4),26
INITIAL    MH37(3,5),43
INITIAL    MH37(3,6),28
INITIAL    MH37(3,7),14
INITIAL    MH37(3,8),49
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INITIAL    MH37(3,16),38
INITIAL    MH37(3,17),55
INITIAL    MH37(3,18),24
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INITIAL    MH37(4,2),18
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INITIAL    MH37(4,6),45
INITIAL    MH37(4,7),35
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INITIAL    MH37(4,11),34
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INITIAL    MH37(4,13),48
INITIAL    MH37(4,14),28
INITIAL    MH37(4,15),31
INITIAL    MH37(4,16),17
INITIAL    MH37(4,17),34
INITIAL    MH37(4,18),45
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INITIAL    MH37(5,2),38
INITIAL    MH37(5,3),29
INITIAL    MH37(5,4),44
INITIAL    MH37(5,5),27
INITIAL    MH37(5,6),15
INITIAL    MH37(5,7),24
INITIAL    MH37(5,8),38
INITIAL    MH37(5,9),48
INITIAL    MH37(5,10),28
INITIAL    MH37(5,11),42
INITIAL    MH37(5,12),55
INITIAL    MH37(5,13),38
INITIAL    MH37(5,14),28
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INITIAL    MH37(5,16),38
INITIAL    MH37(5,17),52
INITIAL    MH37(5,18),17
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INITIAL    MH40(1,5),0
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INITIAL     MH41(1-5,2),897
INITIAL     MH41(1-5,3),996
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INITIAL     MH41(6,2),111
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INITIAL     MH41(10,2),190
INITIAL     MH41(14,2),11
INITIAL     MH41(18,2),235
INITIAL     MH41(6,3),947
INITIAL     MH41(7,3),816
INITIAL     MH41(8,3),1000
INITIAL     MH41(9,3),38
INITIAL     MH41(10-13,3),1000
INITIAL     MH41(14,3),869
INITIAL     MH41(15,3),1000
INITIAL     MH41(16,3),174
INITIAL     MH41(17-18,3),1000
INITIAL     MH42(1-5,1),782
INITIAL     MH42(1-5,2),897
INITIAL     MH42(1-5,3),996
INITIAL     MH42(6,1),30
INITIAL     MH42(14,1),2
INITIAL     MH42(6,2),111
INITIAL     MH42(7,2),2
INITIAL     MH42(10,2),190
INITIAL     MH42(14,2),11
INITIAL     MH42(18,2),235
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INITIAL     MH42(7,3),816
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INITIAL     MH42(9,3),38
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INITIAL     MH42(14,3),869
INITIAL     MH42(15,3),1000
INITIAL     MH42(16,3),174
INITIAL     MH42(17-18,3),1000
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INITIAL     MH39(1,2),597
INITIAL     MH39(1-7,3),847
INITIAL     MH39(1-7,4),897
INITIAL     MH39(1-7,5-8),996
INITIAL     MH39(1-7,9-15),997
INITIAL     MH39(1-7,16-17),1000
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INITIAL     MH39(2-7,2),598
INITIAL     MH39(8,1),260
INITIAL     MH39(8,2),522
INITIAL     MH39(8,3),740
INITIAL     MH39(8,4),784
INITIAL     MH39(8,5-7),871
INITIAL     MH39(8,8),954
INITIAL     MH39(8,9-13),955
INITIAL     MH39(8,14-15),998
INITIAL     MH39(8,16-17),1000
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INITIAL     MH39(9-18,2),502
INITIAL     MH39(9,3),711
INITIAL     MH39(10-18,3),710
INITIAL     MH39(9-18,4),752
INITIAL     MH39(9-18,5),836
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INITIAL     MH39(10-18,6),928
INITIAL     MH39(9-18,7),946
INITIAL     MH39(9-18,8),947
INITIAL     MH39(9-18,9),948
INITIAL     MH39(9,10),954
INITIAL     MH39(10-18,10),954
INITIAL     MH39(9-18,11-13),955
INITIAL     MH39(9,11),954
INITIAL     MH39(9-18,14),996
INITIAL     MH39(9-18,15),997
INITIAL     MH39(9-18,16),998
INITIAL     MH39(9-18,17),999
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INITIAL     MH39(24,3),763
INITIAL     MH39(24,4),807
INITIAL     MH39(24,5),897
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INITIAL     MH39(24,9-13),998
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INITIAL     MH39(5,18),9
INITIAL     MH39(6,18),14
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INITIAL     MH39(17,18),48
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INITIAL     MH39(19,18),43
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INITIAL     MH38(1,2),597
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INITIAL     MH38(1-7,5-8),996
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INITIAL     MH38(24,4),807
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INITIAL     MH38(12,18),40
INITIAL     MH38(13,18),46
INITIAL     MH38(14,18),46
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INITIAL     MH38(17,18),60
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INITIAL     MH38(19,18),53
INITIAL     MH38(20,18),46
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INITIAL     MH38(22,18),26
INITIAL     MH38(23,18),7
INITIAL     MH38(24,18),12
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INITIAL     MH43(9-12,2),39
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INITIAL     MH43(5-6,3),40
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INITIAL     MH43(3,4),38
INITIAL     MH43(5,4),38
INITIAL     MH43(7,4),38
INITIAL     MH43(9,4),38
INITIAL     MH43(11,4),38
INITIAL     MH43(13,4),38
INITIAL     MH43(14,4),38
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INITIAL     MH43(5-8,5),4
INITIAL     MH43(11-14,5),5
INITIAL     MH43(15,5),12
INITIAL     MH43(16,5),12
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INITIAL     MH43(9-10,6),1
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INITIAL     MH43(5-8,7),1
INITIAL     MH43(9-10,7),2
INITIAL     MH43(1-4,8),3
INITIAL     MH43(5-8,8),2
INITIAL     MH43(9-10,8),3
INITIAL     MH43(11-16,8),1
INITIAL     MH43(1-4,10),1
INITIAL     MH43(9-10,10),1
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INITIAL     MH43(1-2,11),20
INITIAL     MH43(5-6,11),10
INITIAL     MH43(7-8,11),12
INITIAL     MH43(9-10,11),20
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INITIAL     MH43(14,11),8
INITIAL     MH43(15,11),10
INITIAL     MH43(16,11),8
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INITIAL     MH01(2,3),58
INITIAL     MH01(2,4),61
INITIAL     MH01(2,5),7
INITIAL     MH01(2,6),576
INITIAL     MH01(2,7),448
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INITIAL     MH01(2,9),777
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INITIAL     MH01(2,13),5
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INITIAL    MH01(3,8),891
INITIAL    MH01(3,9),753
INITIAL    MH01(3,10),996
INITIAL    MH01(3,11),995
INITIAL    MH01(3,12),6
INITIAL    MH01(3,13),7
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INITIAL    MH01(4,2),163
INITIAL    MH01(4,3),118
INITIAL    MH01(4,4),113
INITIAL    MH01(4,5),29
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INITIAL    MH01(4,8),755
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INITIAL    MH01(4,11),979
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INITIAL    MH01(4,13),9
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INITIAL    MH01(5,4),82
INITIAL    MH01(5,5),41
INITIAL    MH01(5,6),494
INITIAL    MH01(5,5),441
INITIAL    MH01(5,8),724
INITIAL    MH01(5,9),770
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INITIAL    MH01(6,5),49
INITIAL    MH01(6,6),642
INITIAL    MH01(6,7),431
INITIAL    MH01(6,8),776
INITIAL    MH01(6,9),820
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INITIAL    MH01(6,13),13
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INITIAL    MH01(8,11),995
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INITIAL    MH01(9,4),153
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INITIAL    MH01(9,8),939
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INITIAL     MH01(10,4),109
INITIAL     MH01(10,5),53
INITIAL     MH01(10,6),757
INITIAL     MH01(10,7),456
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INITIAL     MH01(10,9),803
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INITIAL     MH01(10,13),21
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INITIAL     MH01(11,9),602
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INITIAL     MH01(16,13),33
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INITIAL     MH01(17,3),1000
INITIAL     MH01(17,4),30
INITIAL     MH01(17,5),13
INITIAL     MH01(17,6),413
INITIAL     MH01(17,7),835
INITIAL     MH01(17,8),835
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INITIAL     MH01(17,13),35
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INITIAL     MH2(4,1-2),938
INITIAL     MH2(5-6,1-2),979
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INITIAL     MH3(3,1-2),48
INITIAL     MH3(4,1-2),72
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INITIAL     MH4(1,3),798
INITIAL     MH4(1,4),841
INITIAL     MH4(1,5),762
INITIAL     MH4(1,6),752
INITIAL     MH4(1,7),714
INITIAL     MH4(1,8),640
INITIAL     MH4(1-6,9),1000
INITIAL     MH4(2,1),850
INITIAL     MH4(2,2),800
INITIAL     MH4(2,3),857
INITIAL     MH4(2,4),911
INITIAL     MH4(2,5),878
INITIAL     MH4(2,6),883
INITIAL     MH4(2,7),876
INITIAL     MH4(2,8),820
INITIAL     MH4(2-3,10),750
INITIAL     MH4(3,1),850
INITIAL     MH4(3,2),833
INITIAL     MH4(3,3),881
INITIAL     MH4(3,4),943
INITIAL     MH4(3,5),901
INITIAL     MH4(3,6),905
INITIAL     MH4(3,7),933
INITIAL     MH4(3,8),910
INITIAL     MH4(4,1),850
INITIAL     MH4(4,2),866
INITIAL     MH4(4,3),914
INITIAL     MH4(4,4),956
INITIAL     MH4(4,5),948
INITIAL     MH4(4,6),956
INITIAL     MH4(4,7),962
INITIAL     MH4(4,8),944
INITIAL     MH4(4-6,10),1000
INITIAL     MH4(5,1),875
INITIAL     MH4(5,2),900
INITIAL     MH4(5,3),950
INITIAL     MH4(5,4),981
INITIAL     MH4(5,5),977
INITIAL     MH4(5,6),992
INITIAL     MH4(5,7),991
INITIAL     MH4(5,8),989
INITIAL     MH4(6,1),950
INITIAL     MH4(6,2),967
INITIAL     MH4(6,3),977
INITIAL     MH4(6,4),981
INITIAL     MH4(6,5),994
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(continued)

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INITIAL     MH4(6,6-7),1000
INITIAL     MH4(6,8),989
INITIAL     MH5(1,8),71
INITIAL     MH5(1,11),63
INITIAL     MH5(1,13),455
INITIAL     MH5(1,14),400
INITIAL     MH5(2,1),2
INITIAL     MH5(2,4),60
INITIAL     MH5(2,6),59
INITIAL     MH5(2,8),143
INITIAL     MH5(2,11),313
INITIAL     MH5(2,12),933
INITIAL     MH5(2,13),728
INITIAL     MH5(2,14),600
INITIAL     MH5(3,1),2
INITIAL     MH5(3,3),17
INITIAL     MH5(3,4),80
INITIAL     MH5(3,5),56
INITIAL     MH5(3,6),118
INITIAL     MH5(3,7),91
INITIAL     MH5(3,8),143
INITIAL     MH5(3,9),48
INITIAL     MH5(3,10),71
INITIAL     MH5(3,11),501
INITIAL     MH5(3,12),333
INITIAL     MH5(3,13),819
INITIAL     MH5(3,14),800
INITIAL     MH5(4,1),6
INITIAL     MH5(4,2),6
INITIAL     MH5(4,3),51
INITIAL     MH5(4,4),120
INITIAL     MH5(4,5),111
INITIAL     MH5(4,6),176
INITIAL     MH5(4,7),136
INITIAL     MH5(4,8),143
INITIAL     MH5(4,9),238
INITIAL     MH5(4,10),286
INITIAL     MH5(4,11),564
INITIAL     MH5(4,12),333
INITIAL     MH5(4,13),910
INITIAL     MH5(4-6,14),1000
INITIAL     MH5(5,1),6
INITIAL     MH5(5,2),13
INITIAL     MH5(5,3),85
INITIAL     MH5(5,4),200
INITIAL     MH5(5,5),222
INITIAL     MH5(5,6),294
INITIAL     MH5(5,7),227
INITIAL     MH5(5,8),214
INITIAL     MH5(5,9),381
INITIAL     MH5(5,10),500
INITIAL     MH5(5,11),814
INITIAL     MH5(5,12),667
INITIAL     MH5(5,13),910
INITIAL     MH5(6,1),12
INITIAL     MH5(6,2),16
INITIAL     MH5(6,3),171
INITIAL     MH5(6,4),260
INITIAL     MH5(6,5),389
INITIAL     MH5(6,6),412
INITIAL     MH5(6,7),485
INITIAL     MH5(6,8),429
INITIAL     MH5(6,9),810
INITIAL     MH5(6,10),500
INITIAL     MH5(6,11),877
INITIAL     MH5(6,12-13),1000
INITIAL     MH06(1-2,1),771
INITIAL     MH06(1,2),867
INITIAL     MH06(1,3),638
INITIAL     MH06(1,4),744
INITIAL     MH06(1,5),628
INITIAL     MH06(1,6),553
INITIAL     MH06(1,7),625
INITIAL     MH06(1,8),813
INITIAL     MH06(1-6,9-10),1000
INITIAL     MH06(2-3,2),933
INITIAL     MH06(2,3),732
INITIAL     MH06(2,4),849
INITIAL     MH06(2,5),857
INITIAL     MH06(2,6),766
INITIAL     MH06(2,7),750
INITIAL     MH06(2,8),983
INITIAL     MH06(3-4,1),800
INITIAL     MH06(3,3),764
INITIAL     MH06(3,4),860
INITIAL     MH06(3.5).884
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INITIAL     MH06(3,6),809
INITIAL     MH06(3,7),72
INITIAL     MH06(3,8),938
INITIAL     MH06(4-6,2),1000
INITIAL     MH06(4,3),795
INITIAL     MH06(4,4),884
INITIAL     MH06(4,5),907
INITIAL     MH06(4,6),894
INITIAL     MH06(4,7),875
INITIAL     MH06(4,8),979
INITIAL     MH06(5,1),829
INITIAL     MH06(5,3),874
INITIAL     MH06(5,4),953
INITIAL     MH06(5,5),977
INITIAL     MH06(5,6),979
INITIAL     MH06(5,7),958
INITIAL     MH06(5-6,8),1000
INITIAL     MH06(6,1),914
INITIAL     MH06(6,3),939
INITIAL     MH06(6,4),977
INITIAL     MH06(6,5-7),1000
INITIAL     MH07(1,8),250
INITIAL     MH07(1,11),231
INITIAL     MH07(1,13),545
INITIAL     MH07(1,14),500
INITIAL     MH07(2-5,2),7
INITIAL     MH07(2,8),375
INITIAL     MH07(2,11),385
INITIAL     MH07(2,12),333
INITIAL     MH07(2,13),818
INITIAL     MH07(2-6,14),1000
INITIAL     MH07(3-5,6),167
INITIAL     MH07(3-4,8),500
INITIAL     MH07(3-4,9),63
INITIAL     MH07(3-4,11),462
INITIAL     MH07(3,12),667
INITIAL     MH07(3,13),818
INITIAL     MH07(4-5,10),273
INITIAL     MH07(4-6,12),1000
INITIAL     MH07(4-5,13),909
INITIAL     MH07(5,1),13
INITIAL     MH07(5,3),40
INITIAL     MH07(5,4),37
INITIAL     MH07(5,5),125
INITIAL     MH07(5,8),625
INITIAL     MH07(5,9),188
INITIAL     MH07(5,11),846
INITIAL     MH07(6,1),20
INITIAL     MH07(6,2),14
INITIAL     MH07(6,3),120
INITIAL     MH07(6,4),74
INITIAL     MH07(6,5-6),500
INITIAL     MH07(6,8),750
INITIAL     MH07(6,9),688
INITIAL     MH07(6,10),909
INITIAL     MH07(6,11-13),1000
INITIAL     MH08(1,1),793
INITIAL     MH08(1-4,2),857
INITIAL     MH08(1,3),549
INITIAL     MH08(1,4),629
INITIAL     MH08(1,5),492
INITIAL     MH08(1,6),547
INITIAL     MH08(1,7),586
INITIAL     MH08(1,8),593
INITIAL     MH08(1,9-10),200
INITIAL     MH08(2-3,1),862
INITIAL     MH08(2,3),637
INITIAL     MH08(2,4),743
INITIAL     MH08(2,5),651
INITIAL     MHC8(2,6),693
INITIAL     MH08(2,7),776
INITIAL     MH08(2,8),765
INITIAL     MH08(2,9-10),800
INITIAL     MH08(3,3),725
INITIAL     MH08(3,4),757
INITIAL     MH08(3,5),762
INITIAL     MH08(3,6),747
INITIAL     MH08(3,7),810
INITIAL     MH08(3,8),852
INITIAL     MH08(3-5,9),800
INITIAL     MH08(3-6,10),1000
INITIAL     MH08(4,1),897
INITIAL     MH08(4,3),775
INITIAL     MH08(4,4),814
INITIAL     MH08(4,5),794
INITIAL     MH08(4,6),800
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(continued)

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INITIAL     MH08(4,7),879
INITIAL     MH08(4,8),963
INITIAL     MH08(5-6,1),931
INITIAL     MH08(5-6,2),1000
INITIAL     MH08(5,3),804
INITIAL     MH08(5,4),857
INITIAL     MH08(5,5),873
INITIAL     MH08(5,6),893
INITIAL     MH08(5,7),914
INITIAL     MH08(5,8),975
INITIAL     MH08(6,3),902
INITIAL     MH08(6,4),943
INITIAL     MH08(6,5),1000
INITIAL     MH08(6,6),960
INITIAL     MH08(6,7),966
INITIAL     MH08(6,8-9),1000
INITIAL     MH09(1-4,2),7
INITIAL     MH09(1-5,5),56
INITIAL     MH09(1-5,9),91
INITIAL     MH09(1,11),182
INITIAL     MH09(1,13),357
INITIAL     MH09(1,14),714
INITIAL     MH09(2-5,3),57
INITIAL     MH09(2-3,8),59
INITIAL     MH09(2,11),273
INITIAL     MH09(2,12),154
INITIAL     MH09(2,13),643
INITIAL     MH09(2-5,14),857
INITIAL     MH09(3-5,1),7
INITIAL     MH09(3,10),83
INITIAL     MH09(3,11),409
INITIAL     MH09(3,12),385
INITIAL     MH09(3,13),714
INITIAL     MH09(4,4),54
INITIAL     MH09(4,6),83
INITIAL     MH09(4,7),167
INITIAL     MH09(4,8),176
INITIAL     MH09(4,10),167
INITIAL     MH09(4,11),500
INITIAL     MH09(4,12),538
INITIAL     MH09(4-6,13),929
INITIAL     MH09(5,2),29
INITIAL     MH09(5,4),81
INITIAL     MH09(5,6-7),250
INITIAL     MH09(5,8),294
INITIAL     MH09(5,10),417
INITIAL     MH09(5,11),545
INITIAL     MH09(5,12),769
INITIAL     MH09(6,1),21
INITIAL     MH09(6,2),36
INITIAL     MH09(6,3),200
INITIAL     MH09(6,4),270
INITIAL     MH09(6,5),222
INITIAL     MH09(6,6),583
INITIAL     MH09(6,7),333
INITIAL     MH09(6,8),647
INITIAL     MH09(6,9),455
INITIAL     MH09(6,10),750
INITIAL     MH09(6,11),773
INITIAL     MH09(6,12),846
INITIAL     MH09(6,14),1000
INITIAL     MH10(1,1),762
INITIAL     MH10(1-2,2),800
INITIAL     MH10(1,3),575
INITIAL     MH10(1,4),764
INITIAL     MH10(1,5),644
INITIAL     MH10(1,6),844
INITIAL     MH10(1,7),576
INITIAL     MH10(1,8),695
INITIAL     MH10(1,9),200
INITIAL     MH10(1,10),333
INITIAL     MH10(2,1),857
INITIAL     MH10(2,2),613
INITIAL     MH10(2,4),831
INITIAL     MH10(2,5),763
INITIAL     MH10(2,6),877
INITIAL     MH10(2,7),833
INITIAL     MH10(2,8),829
INITIAL     MH10(2,9),800
INITIAL     MH10(2,10),667
INITIAL     MH10(3-5,1),905
INITIAL     MH10(3-5,2),933
INITIAL     MH10(3,3),689
INITIAL     MH10(3,4),872
INITIAL     MH10(3,5),780
INITIAL     MH10(3,6),902
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(continued)

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      INITIAL     MH10(3,7),879
      INITIAL     MH10(3,8),878
      INITIAL     MH10(3-6,9-10),1000
      INITIAL     MH10(4,3),755
      INITIAL     MH10(4,4),905
      INITIAL     MH10(4,5),831
      INITIAL     MH10(4,6),918
      INITIAL     MH10(4,7),924
      INITIAL     MH10(4,8),951
      INITIAL     MH10(5,3),783
      INITIAL     MH10(5,4),939
      INITIAL     MH10(5,5),898
      INITIAL     MH10(5,6),959
      INITIAL     MH10(5,7),955
      INITIAL     MH10(5,8),988
      INITIAL     MH10(6,1),952
      INITIAL     MH10(6,2),1000
      INITIAL     MH10(6,3),906
      INITIAL     MH10(6,4),986
      INITIAL     MH10(6,5),949
      INITIAL     MH10(6,6),984
      INITIAL     MH10(6,7),985
      INITIAL     MH10(6,8),1000
      INITIAL     MH11(2-3,3),30
      INITIAL     MH11(3-5,4),115
      INITIAL     MH11(4-5,8),77
      INITIAL     MH11(2-4,9),111
      INITIAL     MH11(2-3,13),733
      INITIAL     MH11(4-6,13),1000
      INITIAL     MH11(1,2),3
      INITIAL     MH11(1,7),77
      INITIAL     MH11(1,10),154
      INITIAL     MH11(1,11),105
      INITIAL     MH11(1,12),83
      INITIAL     MH11(1,13),667
      INITIAL     MH11(2,2),10
      INITIAL     MH11(2,4),77
      INITIAL     MH11(2,7),154
      INITIAL     MH11(2,10),308
      INITIAL     MH11(2,11),263
      INITIAL     MH11(2,12),250
      INITIAL     MH11(3,2),17
      INITIAL     MH11(3,7),231
      INITIAL     MH11(3,10),385
      INITIAL     MH11(3,11),526
      INITIAL     MH11(3,12),417
      INITIAL     MH11(4,2),24
      INITIAL     MH11(4,3),61
      INITIAL     MH11(4,6),63
      INITIAL     MH11(4,7),308
      INITIAL     MH11(4,10),538
      INITIAL     MH11(4,11),632
      INITIAL     MH11(4,12),500
      INITIAL     MH11(5,1),19
      INITIAL     MH11(5,2),31
      INITIAL     MH11(5,3),182
      INITIAL     MH11(5,6),125
      INITIAL     MH11(5,7),385
      INITIAL     MH11(5,9),444
      INITIAL     MH11(5,10),769
      INITIAL     MH11(5,11),789
      INITIAL     MH11(5,12),750
      INITIAL     MH11(6,1),39
      INITIAL     MH11(6,2),49
      INITIAL     MH11(6,3),303
      INITIAL     MH11(6,4),221
      INITIAL     MH11(6,5),71
      INITIAL     MH11(6,6),500
      INITIAL     MH11(6,7),462
      INITIAL     MH11(6,8),692
      INITIAL     MH11(6,9),667
      INITIAL     MH11(6,10),846
      INITIAL     MH11(6,11),947
      INITIAL     MH11(6,12),833
      INITIAL     MH12(3-4,1),854
      INITIAL     MH12(3-4,2),882
      INITIAL     MH12(2-3,4),916
      INITIAL     MH12(4-5,6),959
      INITIAL     MH12(5-6,7-10),1000
      INITIAL     MH12(1-4,9),1000
      INITIAL     MH12(1-3,10),333
      INITIAL     MH12(1,1),756
      INITIAL     MH12(1,2),676
      INITIAL     MH12(1,3),650
      INITIAL     MH12(1,4),885
      INITIAL     MH12(1,5),394
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(continued)

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INITIAL     MH12(1,6),891
INITIAL     MH12(1,7),531
INITIAL     MH12(1,8),826
INITIAL     MH12(2,1),829
INITIAL     MH12(2,2),824
INITIAL     MH12(2,3),744
INITIAL     MH12(2,5),606
INITIAL     MH12(2,6),925
INITIAL     MH12(2,7),796
INITIAL     MH12(2,8),926
INITIAL     MH12(2,9),167
INITIAL     MH12(3,3),786
INITIAL     MH12(3,5),667
INITIAL     MH12(3,6),944
INITIAL     MH12(3,7),837
INITIAL     MH12(3,8),942
INITIAL     MH12(4,3),829
INITIAL     MH12(4,4),939
INITIAL     MH12(4,5),758
INITIAL     MH12(4,7),918
INITIAL     MH12(4,8),975
INITIAL     MH12(4,10),667
INITIAL     MH12(5,1),878
INITIAL     MH12(5,2),941
INITIAL     MH12(5,3),880
INITIAL     MH12(5,4),943
INITIAL     MH12(5,5),788
INITIAL     MH12(6,1),976
INITIAL     MH12(6,2),971
INITIAL     MH12(6,3),949
INITIAL     MH12(6,4),966
INITIAL     MH12(6,5),909
INITIAL     MH12(6,6),993
INITIAL     MH13(2-3,2),2
INITIAL     MH13(2-4,3),57
INITIAL     MH13(2-3,4),29
INITIAL     MH13(2-4,5),133
INITIAL     MH13(2-3,8),133
INITIAL     MH13(2-3,9),250
INITIAL     MH13(4-5,9),333
INITIAL     MH13(3-4,10),286
INITIAL     MH13(2-3,13),600
INITIAL     MH13(2-3,13),900
INITIAL     MH13(2-3,14),750
INITIAL     MH13(4-5,14),833
INITIAL     MH13(1,5),67
INITIAL     MH13(1,11),438
INITIAL     MH13(1,12),188
INITIAL     MH13(1,13),400
INITIAL     MH13(1,14),583
INITIAL     MH13(2,1),7
INITIAL     MH13(2,10),143
INITIAL     MH13(2,11),688
INITIAL     MH13(2,12),563
INITIAL     MH13(3,1),14
INITIAL     MH13(3,11),750
INITIAL     MH13(3,12),688
INITIAL     MH13(4,1),27
INITIAL     MH13(4,2),5
INITIAL     MH13(4,4),59
INITIAL     MH13(4,8),267
INITIAL     MH13(4,11),813
INITIAL     MH13(4,12),813
INITIAL     MH13(5,1),34
INITIAL     MH13(5,2),13
INITIAL     MH13(5,3),143
INITIAL     MH13(5,4),118
INITIAL     MH13(5,5),333
INITIAL     MH13(5,6),222
INITIAL     MH13(5,7),83
INITIAL     MH13(5,8),400
INITIAL     MH13(5,10),429
INITIAL     MH13(5,11-12),875
INITIAL     MH13(6,1),55
INITIAL     MH13(6,2),37
INITIAL     MH13(6,3),314
INITIAL     MH13(6,4),324
INITIAL     MH13(6,5),667
INITIAL     MH13(6,6),778
INITIAL     MH13(6,7),333
INITIAL     MH13(6,8),800
INITIAL     MH13(6,9),582
INITIAL     MH13(6,10),714
INITIAL     MH13(6,11-12),938
INITIAL     MH13(6,13-14),1000
INITIAL     MH14(2-3,1),788
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(continued)

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INITIAL     MH14(5-6,2),931
INITIAL     MH14(4-5,5),938
INITIAL     MH14(5-6,8-10),1000
INITIAL     MH14(1-4,9-10),1000
INITIAL     MH14(1,1),758
INITIAL     MH14(1,2),724
INITIAL     MH14(1,3),675
INITIAL     MH14(1,4),896
INITIAL     MH14(1,5),813
INITIAL     MH14(1,6),930
INITIAL     MH14(1,7),286
INITIAL     MH14(1,8),902
INITIAL     MH14(2,2),793
INITIAL     MH14(2,3),727
INITIAL     MH14(2,4),922
INITIAL     MH14(2,5),875
INITIAL     MH14(2,6),961
INITIAL     MH14(2,7),571
INITIAL     MH14(2,8),959
INITIAL     MH14(3,2),828
INITIAL     MH14(3,3),805
INITIAL     MH14(3,4),942
INITIAL     MH14(3,5),906
INITIAL     MH14(3,6),969
INITIAL     MH14(3,7),619
INITIAL     MH14(3,8),975
INITIAL     MH14(4,1),818
INITIAL     MH14(4,2),897
INITIAL     MH14(4,3),844
INITIAL     MH14(4,4),971
INITIAL     MH14(4,6),987
INITIAL     MH14(4,7),762
INITIAL     MH14(4,8),984
INITIAL     MH14(5,1),848
INITIAL     MH14(5,3),883
INITIAL     MH14(5,4),979
INITIAL     MH14(5,6),991
INITIAL     MH14(5,7),857
INITIAL     MH14(6,1),909
INITIAL     MH14(6,3),961
INITIAL     MH14(6,4),996
INITIAL     MH14(6,5),969
INITIAL     MH14(6,6),996
INITIAL     MH14(6,7),905
INITIAL     MH15(4-5,3),231
INITIAL     MH15(2-4,4),91
INITIAL     MH15(1-2,8),71
INITIAL     MH15(6,9-14),1000
INITIAL     MH15(2-4,10),167
INITIAL     MH15(5,11-14),1000
INITIAL     MH15(1,11-12),200
INITIAL     MH15(2,11-12),600
INITIAL     MH15(3,11-12),800
INITIAL     MH15(4,12-14),1000
INITIAL     MH15(1-3,13),1000
INITIAL     MH15(2-3,14),750
INITIAL     MH15(1,14),250
INITIAL     MH15(2,2),2
INITIAL     MH15(2,9),167
INITIAL     MH15(3,2),5
INITIAL     MH15(3,8),214
INITIAL     MH15(3,9),333
INITIAL     MH15(4,2),12
INITIAL     MH15(4,7),250
INITIAL     MH15(4,8),286
INITIAL     MH15(4,9),500
INITIAL     MH15(4,11),900
INITIAL     MH15(5,2),18
INITIAL     MH15(5,4),182
INITIAL     MH15(5,5),125
INITIAL     MH15(5,7),500
INITIAL     MH15(5,8),643
INITIAL     MH15(5,9),667
INITIAL     MH15(5,10),333
INITIAL     MH15(6,1),18
INITIAL     MH15(6,2),29
INITIAL     MH15(6,3),308
INITIAL     MH15(6,4),500
INITIAL     MH15(6,5),250
INITIAL     MH15(6,7),750
INITIAL     MH15(6,8),929
INITIAL     MH16(1-2,1),879
INITIAL     MH16(1-2),2),958
INITIAL     MH16(5-6,1-2),1000
INITIAL     MH16(3-4,2),1000
INITIAL     MH16(2-5,4),996
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(continued)

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INITIAL    MH16(6,4-5),1000
INITIAL    MH16(3-5,5),1000
INITIAL    MH16(2-3,6),981
INITIAL    MH16(4-6,6),990
INITIAL    MH16(1-3,7),875
INITIAL    MH16(4-6,7-10),1000
INITIAL    MH16(4,10),500
INITIAL    MH16(1-3,9),1000
INITIAL    MH16(1,3),720
INITIAL    MH16(1,4),964
INITIAL    MH16(1,5),773
INITIAL    MH16(1,6),942
INITIAL    MH16(1,8),667
INITIAL    MH16(2,3),853
INITIAL    MH16(2,5),909
INITIAL    MH16(2,8),917
INITIAL    MH16(3,1),909
INITIAL    MH16(3,3),893
INITIAL    MH16(3,8),1000
INITIAL    MH16(4,1),970
INITIAL    MH16(4,3),907
INITIAL    MH16(5,3),933
INITIAL    MH16(6,3),973
INITIAL    MH17(1-3,1),9
INITIAL    MH17(3-5,2),6
INITIAL    MH17(4-6,5),667
INITIAL    MH17(5-6,7),250
INITIAL    MH17(1-5,9),333
INITIAL    MH17(1-3,11),333
INITIAL    MH17(4-6,11-14),1000
INITIAL    MH17(1-3,12-14),1000
INITIAL    MH17(1,5),167
INITIAL    MH17(2,5),333
INITIAL    MH17(3,5),500
INITIAL    MH17(4,1),18
INITIAL    MH17(4,4),71
INITIAL    MH17(5,1),27
INITIAL    MH17(5,4),143
INITIAL    MH17(6,1),106
INITIAL    MH17(6,2),35
INITIAL    MH17(6,3),143
INITIAL    MH17(6,4),214
INITIAL    MH17(6,6),500
INITIAL    MH17(6,8),500
INITIAL    MH17(6,9),1000
INITIAL    MH18(6,1-10),1000
INITIAL    MH18(6,2),989
INITIAL    MH18(1-5,2),1000
INITIAL    MH18(2-3,4),981
INITIAL    MH18(4-5,4),991
INITIAL    MH18(2-3,5),938
INITIAL    MH18(4-5,5),969
INITIAL    MH18(2-3,6),964
INITIAL    MH18(4-5,6),1000
INITIAL    MH18(2-5,7),900
INITIAL    MH18(3-5,8-10),1000
INITIAL    MH18(1-2,9-10),1000
INITIAL    MH18(1,3),817
INITIAL    MH18(1,4),935
INITIAL    MH18(1,5),781
INITIAL    MH18(1,6),893
INITIAL    MH18(1,7),800
INITIAL    MH18(1,8),643
INITIAL    MH18(2,1),750
INITIAL    MH18(2,3),946
INITIAL    MH18(2,8),929
INITIAL    MH18(3,1),857
INITIAL    MH18(3,3),957
INITIAL    MH18(4,1),893
INITIAL    MH18(4,3),968
INITIAL    MH18(5,1),929
INITIAL    MH18(5,3),978
INITIAL    MH19(4-5,2),11
INITIAL    MH19(1-2,3),56
INITIAL    MH19(3-5,3),111
INITIAL    MH19(4-5,7),333
INITIAL    MH19(5-6,8-14),1000
INITIAL    MH19(1-4,10),1000
INITIAL    MH19(1-4,12-14),1000
INITIAL    MH19(2,11),400
INITIAL    MH19(3,2),6
INITIAL    MH19(3,11),600
INITIAL    MH19(4,4),385
INITIAL    MH19(4,8),667
INITIAL    MH19(4,11),800
INITIAL    MH19(5,4),692
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(continued)

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INITIAL    MH19(6,3),278
INITIAL    MH19(6,4),1000
INITIAL    MH19(6,5),250
INITIAL    MH19(6,7),667
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INITIAL    MH20(5-6,4),995
INITIAL    MH20(3-5,2),1000
INITIAL    MH20(5,5-10),1000
INITIAL    MH20(2-3,6),981
INITIAL    MH20(1-4,7-10),1000
INITIAL    MH20(1,8),965
INITIAL    MH20(1,1),800
INITIAL    MH20(1,2),828
INITIAL    MH20(1,3),987
INITIAL    MH20(1,4),947
INITIAL    MH20(1,5),825
INITIAL    MH20(1,6),957
INITIAL    MH20(2,1),891
INITIAL    MH20(2,2),862
INITIAL    MH20(2,3),948
INITIAL    MH20(2,4),979
INITIAL    MH20(2,5),918
INITIAL    MH20(3,1),927
INITIAL    MH20(3,3),960
INITIAL    MH20(3,4),984
INITIAL    MH20(3,5),959
INITIAL    MH20(4,1),945
INITIAL    MH20(4,3),979
INITIAL    MH20(4,4),989
INITIAL    MH20(4,5),990
INITIAL    MH20(4,6),994
INITIAL    MH20(5,1),964
INITIAL    MH20(5,3),988
INITIAL    MH21(4-5,8),667
INITIAL    MH21(4-5,10-11),500
INITIAL    MH21(1-6,12-14),1000
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INITIAL    MH21(2,11),167
INITIAL    MH21(3,1),5
INITIAL    MH21(3,8),333
INITIAL    MH21(3,11),333
INITIAL    MH21(4,1),7
INITIAL    MH21(5,1),11
INITIAL    MH21(5,3),29
INITIAL    MH21(5,4),727
INITIAL    MH21(5,9),200
INITIAL    MH21(6,1),20
INITIAL    MH21(6,2),11
INITIAL    MH21(6,3),88
INITIAL    MH21(6,4),909
INITIAL    MH21(6,5),100
INITIAL    MH21(6,6),600
INITIAL    MH21(6,7),500
INITIAL    MH21(6,8),1000
INITIAL    MH21(6,9),600
INITIAL    MH21(6,10),1000
INITIAL    MH21(6,11),667
INITIAL    MH22(1-5,1),960
INITIAL    MH22(6,1-2),1000
INITIAL    MH22(2-5,2),1000
INITIAL    MH22(6,4-5),1000
INITIAL    MH22(4-5,4),1000
INITIAL    MH22(4-6,6-10),1000
INITIAL    MH22(1-3,9-10),1000
INITIAL    MH22(1,2),889
INITIAL    MH22(1,3),891
INITIAL    MH22(1,4),940
INITIAL    MH22(1,5),866
INITIAL    MH22(1,6),959
INITIAL    MH22(1,7),955
INITIAL    MH22(1,8),971
INITIAL    MH22(2,3),950
INITIAL    MH22(2,4),952
INITIAL    MH22(2,5),975
INITIAL    MH22(2,6),994
INITIAL    MH22(2,7),985
INITIAL    MH22(2,8),989
INITIAL    MH22(3,3),968
INITIAL    MH22(3,4),976
INITIAL    MH22(3,5),983
INITIAL    MH22(3,6),1000
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INITIAL    MH22(3,8),1000
INITIAL    MH22(4,3),982
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(continued)

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INITIAL     MH22(5,5),992
INITIAL     MH22(6,3),995
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INITIAL     MH23(1-6,10-14),1000
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INITIAL     MH23(1-3,13),0
INITIAL     MH23(5,3),71
INITIAL     MH23(5,5),200
INITIAL     MH23(5,9),333
INITIAL     MH23(6,1),5
INITIAL     MH23(6,2),7
INITIAL     MH23(6,3),107
INITIAL     MH23(6,4),1000
INITIAL     MH23(6,5),400
INITIAL     MH23(6,6),200
INITIAL     MH23(6,7),250
INITIAL     MH23(6,9),667
INITIAL     MH24(1-6,1-2),1000
INITIAL     MH24(2-6,4),1000
INITIAL     MH24(4-6,5),994
INITIAL     MH24(2-3,6),989
INITIAL     MH24(4-6,6),1000
INITIAL     MH24(3-4,7),991
INITIAL     MH24(5-6,7),1000
INITIAL     MH24(1-6,8-10),1000
INITIAL     MH24(1-2,8),986
INITIAL     MH24(1,3),930
INITIAL     MH24(1,4),981
INITIAL     MH24(1,5),930
INITIAL     MH24(1,6),958
INITIAL     MH24(1,7),965
INITIAL     MH24(2,3),965
INITIAL     MH24(2,5),975
INITIAL     MH24(2,7),983
INITIAL     MH24(3,3),974
INITIAL     MH24(3,5),981
INITIAL     MH24(4,3),982
INITIAL     MH24(5,3),987
INITIAL     MH24(6,3),991
INITIAL     MH25(1-5,1),2
INITIAL     MH25(5-6,5),250
INITIAL     MH25(1-6,6-14),1000
INITIAL     MH25(1-4,7),0
INITIAL     MH25(1-4,9),0
INITIAL     MH25(1,11),667
INITIAL     MH25(6,1),14
INITIAL     MH25(6,3),118
INITIAL     MH25(6,4),167
INITIAL     MH26(1-6,1),944
INITIAL     MH26(1-6,2),1000
INITIAL     MH26(5-6,3),995
INITIAL     MH26(3-4,4),987
INITIAL     MH26(5-6,4),993
INITIAL     MH26(6,5-10),1000
INITIAL     MH26(2-5,6-10),1000
INITIAL     MH26(2,7),993
INITIAL     MH26(1-3,8),995
INITIAL     MH26(1,9-10),1000
INITIAL     MH26(1,3),935
INITIAL     MH26(1,4),947
INITIAL     MH26(1,5),953
INITIAL     MH26(1,6),967
INITIAL     MH26(1,7),980
INITIAL     MH26(2,3),973
INITIAL     MH26(2,4),980
INITIAL     MH26(2,5),974
INITIAL     MH26(3,3),976
INITIAL     MH26(3,5),985
INITIAL     MH26(4,3),984
INITIAL     MH26(4,5),988
INITIAL     MH26(5,5),997
INITIAL     MH27(3-5,2),2
INITIAL     MH27(3-4,3),43
INITIAL     MH27(5-6,5),500
INITIAL     MH27(4-5,7),286
INITIAL     MH27(2-6,8-14),1000
INITIAL     MH27(2-4,9),0
INITIAL     MH27(1,12),1000
INITIAL     MH27(5,1),1
INITIAL     MH27(5,3),130
INITIAL     MH27(6,1),5
INITIAL     MH27(6,2),8
INITIAL     MH27(6,3),174
INITIAL     MH27(6,4),182
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(continued)

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INITIAL    MH28(1-6,2),1000
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INITIAL    MH28(5-6,3),995
INITIAL    MH28(2-4,4),994
INITIAL    MH28(5-6,4-10),1000
INITIAL    MH28(2-4,5-10),1000
INITIAL    MH28(1-3,6),996
INITIAL    MH28(2-3,8),997
INITIAL    MH28(1-2,10),996
INITIAL    MH28(4,3),990
INITIAL    MH28(3,1),946
INITIAL    MH28(2,1),973
INITIAL    MH28(1,1),892
INITIAL    MH28(1,3),964
INITIAL    MH28(1,4),982
INITIAL    MH28(1,5),989
INITIAL    MH28(1,7),997
INITIAL    MH28(1,8),995
INITIAL    MH28(1,9),875
INITIAL    MH29(4-5,3),91
INITIAL    MH29(5-6,4),333
INITIAL    MH29(5-6,5),1000
INITIAL    MH29(5-6,8),1000
INITIAL    MH29(1-6,11-14),1000
INITIAL    MH29(1,13),0
INITIAL    MH29(4,1),1
INITIAL    MH29(5,1),1
INITIAL    MH29(5,2),2
INITIAL    MH29(6,1),5
INITIAL    MH29(6,2),7
INITIAL    MH29(6,3),182
INITIAL    MH29(6,7),500
INITIAL    MH30(1-6,1-2),1000
INITIAL    MH30(1,1),626
INITIAL    MH30(1,2),963
INITIAL    MH30(1-2,4),968
INITIAL    MH30(2-3,5),986
INITIAL    MH30(5-6,6-10),1000
INITIAL    MH30(1-4,7-10),1000
INITIAL    MH30(1,7),996
INITIAL    MH30(1,8),995
INITIAL    MH30(1,3),953
INITIAL    MH30(1,5),976
INITIAL    MH30(1,6),967
INITIAL    MH30(2,3),967
INITIAL    MH30(2,6),978
INITIAL    MH30(3,3),972
INITIAL    MH30(3,4),976
INITIAL    MH30(3,6),983
INITIAL    MH30(4,3),981
INITIAL    MH30(4,4),984
INITIAL    MH30(4,5),990
INITIAL    MH30(4,6),989
INITIAL    MH30(5,3),991
INITIAL    MH30(5,4),992
INITIAL    MH30(5,5),993
INITIAL    MH30(6,3),1000
INITIAL    MH30(6,4),992
INITIAL    MH30(6,5),997
INITIAL    MH31(3-5,2),1
INITIAL    MH31(5-6,3),222
INITIAL    MH31(6,4-5),500
INITIAL    MH31(6,6-14),1000
INITIAL    MH31(5-6,10),667
INITIAL    MH31(1-5,12-14),1000
INITIAL    MH31(3-4,7),333
INITIAL    MH31(3-4,8),500
INITIAL    MH31(3-4,9-11),333
INITIAL    MH31(4,11),667
INITIAL    MH31(1-2,11),333
INITIAL    MH31(4,3),111
INITIAL    MH31(5,4),250
INITIAL    MH31(5,7),667
INITIAL    MH31(5,8),1000
INITIAL    MH31(5,9),667
INITIAL    MH31(5,11),1000
INITIAL    MH31(6,1),5
INITIAL    MH31(6,2),7
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INITIAL    MH32(2-3,2),917
INITIAL    MH32(4-6,2),1000
INITIAL    MH32(5-6,4),992
INITIAL    MH32(6,5-10),1000
INITIAL    MH32(4-5.5).1000
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INITIAL     MH32(1,3),937
INITIAL     MH32(1,4),888
INITIAL     MH32(1,5),960
INITIAL     MH32(1,6),965
INITIAL     MH32(1,7),969
INITIAL     MH32(1,8),974
INITIAL     MH32(2,3),952
INITIAL     MH32(2,4),944
INITIAL     MH32(2,5),988
INITIAL     MH32(2,6),980
INITIAL     MH32(2,7),990
INITIAL     MH32(2,8),989
INITIAL     MH32(3,3),956
INITIAL     MH32(3,4),976
INITIAL     MH32(3,5),992
INITIAL     MH32(3,7),995
INITIAL     MH32(4,3),967
INITIAL     MH32(4,4),984
INITIAL     MH32(5,3),993
INITIAL     MH32(5,6),995
INITIAL     MH32(6,3),996
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INITIAL     MH33(2-4,2),3
INITIAL     MH33(2-3,4),67
INITIAL     MH33(4-6,5),333
INITIAL     MH33(1-2,7),167
INITIAL     MH33(4-6,7),500
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INITIAL     MH33(2-3,9),125
INITIAL     MH33(4-5,10),500
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INITIAL     MH33(5,12),0
INITIAL     MH33(1-4,13-14),1000
INITIAL     MH33(1-2,13),500
INITIAL     MH33(1,2),2
INITIAL     MH33(3,7),333
INITIAL     MH33(3,10),250
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INITIAL     MH33(4,6),143
INITIAL     MH33(4,9),375
INITIAL     MH33(5,1),6
INITIAL     MH33(5,2),5
INITIAL     MH33(5,3),67
INITIAL     MH33(5,4),200
INITIAL     MH33(5,6),286
INITIAL     MH33(5,9),500
INITIAL     MH33(6,1),10
INITIAL     MH33(6,2),12
INITIAL     MH33(6,3),200
INITIAL     MH33(6,4),267
INITIAL     MH33(6,6),571
INITIAL     MH33(6,8),1000
INITIAL     MH33(6,9),750
INITIAL     MH33(6,10),750
INITIAL     MH34(1-5,1),786
INITIAL     MH34(6,1-3),1000
INITIAL     MH34(1-5,2),1000
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INITIAL     MH34(6,5-10),1000
INITIAL     MH34(5,6-10),1000
INITIAL     MH34(4,7-10),1000
INITIAL     MH34(1-3,8-10),1000
INITIAL     MH34(1,3),903
INITIAL     MH34(1,4),828
INITIAL     MH34(1,5),918
INITIAL     MH34(1,6),879
INITIAL     MH34(1,7),934
INITIAL     MH34(1,8),962
INITIAL     MH34(2,3),938
INITIAL     MH34(2,4),892
INITIAL     MH34(2,5),964
INITIAL     MH34(2,6),935
INITIAL     MH34(2,7),974
INITIAL     MH34(3,3),955
INITIAL     MH34(3,4),946
INITIAL     MH34(3,5),969
INITIAL     MH34(3,6),972
INITIAL     MH34(3,7),987
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INITIAL     MH34(4,4),968
INITIAL     MH34(4,5),974
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         INITIAL     MH35(5-6,5),400
         INITIAL     MH35(1-2,6),111
         INITIAL     MH35(4-5,6),333
         INITIAL     MH35(4-5,7),143
         INITIAL     MH35(2-4,8),250
         INITIAL     MH35(5-6,8),500
         INITIAL     MH35(3-6,10),667
         INITIAL     MH35(3-4,11),333
         INITIAL     MH35(1-6,12-14),1000
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         INITIAL     MH35(2,10),333
         INITIAL     MH35(2,11),167
         INITIAL     MH35(3,6),222
         INITIAL     MH35(4,5),200
         INITIAL     MH35(5,1),10
         INITIAL     MH35(5,2),14
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         INITIAL     MH35(6,2),25
         INITIAL     MH35(6,3),56
         INITIAL     MH35(6,4),188
         INITIAL     MH35(6,6),556
         INITIAL     MH35(6,7),429
         INITIAL     MH35(6,9),400
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* LOGAN
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         INITIAL     MH101(1,3),24
         INITIAL     MH101(1,4),19
         INITIAL     MH101(2,2),7
         INITIAL     MH101(2,3),23
         INITIAL     MH101(2,4),7
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         INITIAL     MH101(3-18,4),1
         INITIAL     MH101(4,3),134
         INITIAL     MH101(5-6,1),2
         INITIAL     MH101(5-6,2),270
         INITIAL     MH101(5,3),135
         INITIAL     MH101(6,3),136
         INITIAL     MH101(7-8,1),3
         INITIAL     MH101(7-8,2),220
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         INITIAL     MH101(8,3),138
         INITIAL     MH101(9-10,1),4
         INITIAL     MH101(9,3),139
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         INITIAL     MH101(10,3),140
         INITIAL     MH101(11-12,1),5
         INITIAL     MH101(11-12,2),150
         INITIAL     MH101(11,3),141
         INITIAL     MH101(12,3),142
         INITIAL     MH101(13-14,1),4
         INITIAL     MH101(13,3),139
         INITIAL     MH101(13-14,2),330
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         INITIAL     MH101(16,3),134
         INITIAL     MH101(17-18,1),3
         INITIAL     MH101(17-18,2),220
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         INITIAL     MH101(18,3),138
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         INITIAL     MX001(3,1-5),820150
         INITIAL     MX001(4,1-5),820200
         INITIAL     MX001(1-4,2),460100
         INITIAL     MX001(5-7,3),560100
         INITIAL     MX001(5,5),780100
         INITIAL     MX001(6,5),780125
         INITIAL     MX001(7,1-2),820150
         INITIAL     MX001(7,4),820150
         INITIAL     MX001(7,5),780150
         INITIAL     MX001(8,1-2),820200
         INITIAL     MX001(8,3),560125
         INITIAL     MX001(8,4),820200
         INITIAL     MX001(8,5),780175
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      INITIAL     MX001(13-16,1),460075
      INITIAL     MX001(13-15,5),580100
      INITIAL     MX001(13-15,5),580100
      INITIAL     MX001(15,2-4),820150
      INITIAL     MX001(16,2-4),820200
      INITIAL     MX001(16,5),580125
      INITIAL     MX001(19,1-5),820150
      INITIAL     MX001(20,1-5),820200
      INITIAL     MX001(23,1-5),820150
      INITIAL     MX001(24,1-5),820200
      INITIAL     MX001(21-24,3),420100
      INITIAL     MX001(25-27,1),620050
      INITIAL     MX001(25-28,2),460100
      INITIAL     MX001(25-27,3),540100
      INITIAL     MX001(25-27,4),480050
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      INITIAL     MX001(26,5),800175
      INITIAL     MX001(27,5),800150
      INITIAL     MX001(28,5),800175
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      INITIAL     MX001(28,3),540125
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      INITIAL     MH133(1,2),4
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      INITIAL     MH133(2,2),7
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      INITIAL     MH133(3,3),7
      INITIAL     MH133(3,5),19
      INITIAL     MH133(3,6),23
      INITIAL     MH133(3-5,7),56
      INITIAL     MH133(3-4,8),43
      INITIAL     MH133(4,2),7
      INITIAL     MH133(5,1),35
      INITIAL     MH133(5,5),19
      INITIAL     MH133(6,1),15
      INITIAL     MH133(6,2),7
      INITIAL     MH133(6,3),35
      INITIAL     MH133(7,1),37
      INITIAL     MH134(1,1),2
      INITIAL     MH134(1,2),4
      INITIAL     MH134(2,1),4
      INITIAL     MH134(2,2),7
      INITIAL     MH134(3-4,1),15
      INITIAL     MH134(3-4,2),2
      INITIAL     MH134(3-4,3),3
      INITIAL     MH134(3,5),19
      INITIAL     MH134(3,6),23
      INITIAL     MH134(3-5,7),56
      INITIAL     MH134(3-4,8),43
      INITIAL     MH134(4,4),10
      INITIAL     MH134(5,1),35
      INITIAL     MH134(5,5),19
      INITIAL     MH134(6,1),15
      INITIAL     MH134(6,2),2
      INITIAL     MH134(6,3),3
      INITIAL     MH134(7,1),37
      INITIAL     MH135(1-2,1),4
      INITIAL     MH135(1-2,2),7
      INITIAL     MH135(1,8),48
      INITIAL     MH135(3-4,1),16
      INITIAL     MH135(3,2),11
      INITIAL     MH135(3,3),2
      INITIAL     MH135(3,4),3
      INITIAL     MH135(3,5),20
      INITIAL     MH135(3,6),24
      INITIAL     MH135(4,2),7
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      INITIAL     MH135(6,1),15
      INITIAL     MH135(6,2),2
      INITIAL     MH135(6,3),3
      INITIAL     MH135(6,4),35
      INITIAL     MH135(7,1),37
      INITIAL     MH136(1-2,1),4
      INITIAL     MH136(1,2),2
      INITIAL     MH136(1,8),48
      INITIAL     MH136(2,2),7
      INITIAL     MH136(3-4,1),16
      INITIAL     MH136(3,2),11
      INITIAL     MH136(3,3),2
      INITIAL     MH136(3,4),3
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(continued)

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INITIAL    MH136(3,5),20
INITIAL    MH136(3,6),24
INITIAL    MH136(4,2),7
INITIAL    MH136(5,1),7
INITIAL    MH136(5,5),20
INITIAL    MH136(6,1),15
INITIAL    MH136(6,2),7
INITIAL    MH136(6,3),35
INITIAL    MH136(7,1),37
INITIAL    MH137(1-2,1),2
INITIAL    MH137(1-2,2),4
INITIAL    MH137(2-3,3),7
INITIAL    MH137(2,8),44
INITIAL    MH137(3-4,1),15
INITIAL    MH137(3,2),10
INITIAL    MH137(3,5),19
INITIAL    MH137(3,6),23
INITIAL    MH137(4,2),7
INITIAL    MH137(5-6,1),35
INITIAL    MH137(5,5),19
INITIAL    MH137(6,2),15
INITIAL    MH137(6,3),7
INITIAL    MH137(6,8),44
INITIAL    MH137(7,1),37
INITIAL    MH138(1-2,1),2
INITIAL    MH138(1-2,2),4
INITIAL    MH138(2,8),44
INITIAL    MH138(3-4,1),15
INITIAL    MH138(3-4,2),2
INITIAL    MH138(3-4,3),3
INITIAL    MH138(3,4),10
INITIAL    MH138(3,5),19
INITIAL    MH138(3,6),23
INITIAL    MH138(5,1),35
INITIAL    MH138(5,5),19
INITIAL    MH138(6,1),15
INITIAL    MH138(6,2),2
INITIAL    MH138(6,3),3
INITIAL    MH138(6,8),44
INITIAL    MH138(7,1),37
INITIAL    MH139(1-2,1),4
INITIAL    MH139(1-2,2),7
INITIAL    MH139(1,7),57
INITIAL    MH139(1,8),46
INITIAL    MH139(3-4,1),16
INITIAL    MH139(3,2),11
INITIAL    MH139(3,3),2
INITIAL    MH139(3,4),3
INITIAL    MH139(3,5),20
INITIAL    MH139(3,6),24
INITIAL    MH139(3,7),57
INITIAL    MH139(4,2),7
INITIAL    MH139(5,1),7
INITIAL    MH139(5,5),20
INITIAL    MH139(5,7),57
INITIAL    MH139(6,1),15
INITIAL    MH139(6,2),2
INITIAL    MH139(6,3),3
INITIAL    MH139(6,4),35
INITIAL    MH139(7,1),37
INITIAL    MH140(1,1),2
INITIAL    MH140(1-2,2),4
INITIAL    MH140(1,7),57
INITIAL    MH140(1,8),46
INITIAL    MH140(2-6,1),7
INITIAL    MH140(3-4,2),16
INITIAL    MH140(3,3),11
INITIAL    MH140(3,5),20
INITIAL    MH140(3,6),24
INITIAL    MH140(3,7),57
INITIAL    MH140(5,5),20
INITIAL    MH140(5,7),57
INITIAL    MH140(6,2),15
INITIAL    MH140(6,3),35
INITIAL    MH140(7,1),37
INITIAL    MH141(1-2,1),4
INITIAL    MH141(1-4,2),7
INITIAL    MH141(2,8),45
INITIAL    MH141(3-4,1),14
INITIAL    MH141(3,3),9
INITIAL    MH141(3,5),18
INITIAL    MH141(3,6),22
INITIAL    MH141(4,8),45
INITIAL    MH141(6,1),15
INITIAL    MH141(6,2),7
INITIAL    MH141(6,3),35
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(continued)

```
         INITIAL     MH141(7,1),37
         INITIAL     MH142(1-2,1),4
         INITIAL     MH142(1,2),2
         INITIAL     MH142(2,2),7
         INITIAL     MH142(2,8),45
         INITIAL     MH142(3-4,1),14
         INITIAL     MH142(3-4,2),2
         INITIAL     MH142(3-4,3),1
         INITIAL     MH142(3,4),9
         INITIAL     MH142(3,5),18
         INITIAL     MH142(3,6),22
         INITIAL     MH142(4,8),45
         INITIAL     MH142(6,1),15
         INITIAL     MH142(6,2),2
         INITIAL     MH142(6,3),1
         INITIAL     MH142(6,4),35
         INITIAL     MH142(7,1),37
* BEDFORD
         INITIAL     MH106(1-2,1),6
         INITIAL     MH106(1,2),7
         INITIAL     MH106(1-2,3),24
         INITIAL     MH106(1,4),133
         INITIAL     MH106(2,4),5
         INITIAL     MH106(3,1),1
         INITIAL     MH106(3,2),110
         INITIAL     MH106(3,3),143
         INITIAL     MH106(4-6,3),156
         INITIAL     MH106(3-6,4),2
         INITIAL     MH106(4,1),2
         INITIAL     MH106(4,2),290
         INITIAL     MH106(5,2),230
         INITIAL     MH106(5,1),3
         INITIAL     MH106(6,2),50
         INITIAL     MH106(6,1),4
         INITIAL     MH143(1,1),53
         INITIAL     MH143(1-4,5),17
         INITIAL     MH143(2-3,1),12
         INITIAL     MH143(2,2),8
         INITIAL     MH143(2,3),1
         INITIAL     MH143(2,6),21
         INITIAL     MH143(2,8),64
         INITIAL     MH143(3,2),1
         INITIAL     MH143(4,1),4
         INITIAL     MH143(4,2),53
         INITIAL     MH143(5,1),1
         INITIAL     MH143(5,2),4
         INITIAL     MX002(1-2,1-4),700100
         INITIAL     MX002(3,1),700100
         INITIAL     MX002(3,2-4),720150
         INITIAL     MX002(4,1),700125
         INITIAL     MX002(4,2-4),760200
         INITIAL     MX002(5-8,1),383100
         INITIAL     MX002(9-11,1),660100
         INITIAL     MX002(9-10,2-4),680100
         INITIAL     MX002(11,2-4),720150
         INITIAL     MX002(12,1),660125
         INITIAL     MX002(12,2-4),760200
         INITIAL     MX002(13-14,1-4),800100
         INITIAL     MX002(15,1-4),800150
         INITIAL     MX002(15,2),800125
         INITIAL     MX002(16,1-4),800200
         INITIAL     MX002(16,2),800150
         INITIAL     MX002(17-18,1-4),680100
         INITIAL     MX002(19,1-4),720150
         INITIAL     MX002(19,2-3),680100
         INITIAL     MX002(20,1-4),760200
         INITIAL     MX002(20,3),680125
         INITIAL     MH156(1,1),53
         INITIAL     MH156(1-4,5),53
         INITIAL     MH156(1-4,5),17
         INITIAL     MH156(2-3,1),1
         INITIAL     MH156(2-3,2),12
         INITIAL     MH156(2,3),8
         INITIAL     MH156(4-5,1),4
         INITIAL     MH156(4,2),53
         INITIAL     MH156(5,2),1
* BEVERLY
         INITIAL     MH107(1-2,1),6
         INITIAL     MH107(1,2),8
         INITIAL     MH107(1,3),18
         INITIAL     MH107(1,4),108
         INITIAL     MH107(2,3),24
         INITIAL     MH107(2,4),4
         INITIAL     MH107(3,1),1
         INITIAL     MH107(3,2),160
         INITIAL     MH107(3-6,3),144
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(continued)

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          INITIAL     MH107(3-6,4),3
          INITIAL     MH107(4,1),2
          INITIAL     MH107(4,2),340
          INITIAL     MH107(5,1),3
          INITIAL     MH107(5,2),90
          INITIAL     MH107(6,1),4
          INITIAL     MH107(6,2),270
          INITIAL     MH144(1,1),25
          INITIAL     MH144(2-4,1),4
          INITIAL     MH144(2,2),3
          INITIAL     MH144(2,3),6
          INITIAL     MH144(3-4,2),33
          INITIAL     MH144(3-4,3),1
          INITIAL     MH144(4,4),1
          INITIAL     MX003(1-2,1-4),600100
          INITIAL     MX003(3,1-4),600150
          INITIAL     MX003(4,1-4),700200
          INITIAL     MX003(5-7,1-4),640100
          INITIAL     MX003(7,2-4),640150
          INITIAL     MX003(8,1),640125
          INITIAL     MX003(8,2-4),700200
          INITIAL     MX003(9-12,1),580100
          INITIAL     MX003(9-10,2-4),600100
          INITIAL     MX003(11,2-4),600150
          INITIAL     MX003(12,2-4),700200
          INITIAL     MX003(13-16,1),500100
          INITIAL     MX003(13-14,2-4),600100
          INITIAL     MX003(15,2-4),600150
          INITIAL     MX003(16,2-4),700200
* FITCHBURG
          INITIAL     MH108(1-2,1),5
          INITIAL     MH108(1,2),8
          INITIAL     MH108(1,3),18
          INITIAL     MH108(1,4),350
          INITIAL     MH108(2,3),24
          INITIAL     MH108(2,4),1
          INITIAL     MH108(3,1),1
          INITIAL     MH108(3,2),140
          INITIAL     MH108(3-5,3),145
          INITIAL     MH108(3-5,4),4
          INITIAL     MH108(4,1),2
          INITIAL     MH108(4,2),320
          INITIAL     MH108(5,1),3
          INITIAL     MH108(5,2),200
          INITIAL     MX004(1,1-4),1140100
          INITIAL     MX004(2,1-4),1400175
          INITIAL     MX004(3,1-4),1420200
          INITIAL     MX004(4,1-4),1600200
          INITIAL     MH145(1,1),32
* FT DEVENS
          INITIAL     MH109(1-2,1),6
          INITIAL     MH109(1-2,3),24
          INITIAL     MH109(1,4),268
          INITIAL     MH109(2,4),1
          INITIAL     MH109(3,1),1
          INITIAL     MH109(3,2),140
          INITIAL     MH109(3-6,3),146
          INITIAL     MH109(3-6,4),5
          INITIAL     MH109(4,1),2
          INITIAL     MH109(4,2),320
          INITIAL     MH109(5,1),3
          INITIAL     MH109(5,2),20
          INITIAL     MH109(6,1),4
          INITIAL     MH109(6,2),200
          INITIAL     MX005(1-2,1-4),940100
          INITIAL     MX005(3,1),940125
          INITIAL     MX005(3,2-4),940150
          INITIAL     MX005(4,1),940150
          INITIAL     MX005(4,2-4),940200
          INITIAL     MH146(1,1),26
* LAWRENCE
          INITIAL     MH110(1-2,1),6
          INITIAL     MH110(1,2),8
          INITIAL     MH110(1,3),21
          INITIAL     MH110(1,4),147
          INITIAL     MH110(2,3),24
          INITIAL     MH110(2,4),2
          INITIAL     MH110(3,1),1
          INITIAL     MH110(3,2),230
          INITIAL     MH110(3,3),147
          INITIAL     MH110(4,3),157
          INITIAL     MH110(5-6,3),158
          INITIAL     MH110(3-6,4),6
          INITIAL     MH110(4,1),2
          INITIAL     MH110(4,2),50
          INITIAL     MH110(5,1),3
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(continued)

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* NORWOOD
        INITIAL     MH114(1-2,1),6
        INITIAL     MH114(1,2),7
        INITIAL     MH114(1,3),23
        INITIAL     MH114(1,4),49
        INITIAL     MH114(2,3),24
        INITIAL     MH114(2,4),4
        INITIAL     MH114(3,1),1
        INITIAL     MH114(3,2),350
        INITIAL     MH114(3-6,3),151
        INITIAL     MH114(3-6,4),10
        INITIAL     MH114(4,1),2
        INITIAL     MH114(4,2),170
        INITIAL     MH114(5,1),3
        INITIAL     MH114(5,2),100
        INITIAL     MH114(6,1),4
        INITIAL     MH114(6,2),280
        INITIAL     MX010(1-3,1-4),640100
        INITIAL     MX010(3,2-4),640150
        INITIAL     MX010(4,1),640125
        INITIAL     MX010(4,2-4),740200
        INITIAL     MX010(5-7,1),580100
        INITIAL     MX010(5-6,2-4),640100
        INITIAL     MX010(7,2-4),640150
        INITIAL     MX010(8,1),580125
        INITIAL     MX010(8,2-4),740200
        INITIAL     MX010(9,1-4),840100
        INITIAL     MX010(10,1-4),840125
        INITIAL     MX010(11,1-4),840150
        INITIAL     MX010(12,1-4),840175
        INITIAL     MX010(13-15,1),580100
        INITIAL     MX010(16,1),580125
        INITIAL     MH151(1-2,1),31
        INITIAL     MH151(2,2),34
        INITIAL     MH151(2,4),52
        INITIAL     MH151(3-4,1),2
        INITIAL     MH151(4,2),5
* PLYMOUTH
        INITIAL     MH115(1-2,1),6
        INITIAL     MH115(1,2),8
        INITIAL     MH115(1,3),18
        INITIAL     MH115(1,4),149
        INITIAL     MH115(2,3),24
        INITIAL     MH115(2,4),1
        INITIAL     MH115(3,1),1
        INITIAL     MH115(3,2),60
        INITIAL     MH115(3-6,3),152
        INITIAL     MH115(3-6,4),11
        INITIAL     MH115(4,1),2
        INITIAL     MH115(4,2),330
        INITIAL     MH115(5,1),3
        INITIAL     MH115(5,2),240
        INITIAL     MH115(6,1),4
        INITIAL     MH115(6,2),150
        INITIAL     MH152(1,1),30
        INITIAL     MX011(1-3,1-4),600100
        INITIAL     MX011(3,2-4),600150
        INITIAL     MX011(4,1-4),1500500
* S. WEYMOUTH
        INITIAL     MH116(1-2,1),6
        INITIAL     MH116(1-2,3),24
        INITIAL     MH116(1,4),161
        INITIAL     MH116(2,4),3
        INITIAL     MH116(3,1),1
        INITIAL     MH116(3,2).350
        INITIAL     MH116(3,3),153
        INITIAL     MH116(3-6,4),12
        INITIAL     MH116(4,1),2
        INITIAL     MH116(4,2),80
        INITIAL     MH116(5,1),3
        INITIAL     MH116(5,2),260
        INITIAL     MH116(6,1),4
        INITIAL     MH116(6,2),170
        INITIAL     MH116(4,3),159
        INITIAL     MH116(5,3),160
        INITIAL     MH116(6,3),161
        INITIAL     MX012(1-4,1),620100
        INITIAL     MX012(1-2,2-4),640100
        INITIAL     MX012(3,2-4),640150
        INITIAL     MX012(4,2-4),720200
        INITIAL     MX012(5-6,1-4),640100
        INITIAL     MX012(7,1-4),640150
        INITIAL     MX012(8,1-4),720200
        INITIAL     MX012(9-12,1),520100
        INITIAL     MX012(9-12,2),540100
        INITIAL     MX012(9-12,3),560100
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(continued)

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         INITIAL    MX012(9-10,4),640100
         INITIAL    MX012(11,4),640150
         INITIAL    MX012(12,4),720200
         INITIAL    MH153(1-2,1),2
         INITIAL    MH153(1-2,2),5
         INITIAL    MH153(1,3),36
         INITIAL    MH153(3,1),27
         INITIAL    MH153(1,1),27
         INITIAL    MH153(3,1),2
         INITIAL    MH153(3,2),5
         INITIAL    MH153(3,3),36
         INITIAL    MH153(3,8),61
         INITIAL    MH153(1,2-3),0
         INITIAL    MH159(1,1),27
         INITIAL    MH159(2-3,1),2
         INITIAL    MH159(2-3,2),5
         INITIAL    MH159(3,3),36
         INITIAL    MH159(3,8),58
         INITIAL    MH160(1,1),27
         INITIAL    MH160(2-3,1),2
         INITIAL    MH160(2-3,2),5
         INITIAL    MH160(3,3),36
         INITIAL    MH160(3,7),62
         INITIAL    MH160(3,8),59
         INITIAL    MH161(1,1),27
         INITIAL    MH161(2-3,1),2
         INITIAL    MH161(2-3,2),5
         INITIAL    MH161(3,3),36
*  TAUNTON
         INITIAL    MH117(1-2,1),4
         INITIAL    MH117(1,2),8
         INITIAL    MH117(1,3),18
         INITIAL    MH117(1,4),92
         INITIAL    MH117(2,3),24
         INITIAL    MH117(2,4),3
         INITIAL    MH117(3,1),1
         INITIAL    MH117(3,2),300
         INITIAL    MH117(3-4,3),154
         INITIAL    MH117(3-4,4),13
         INITIAL    MH117(4,1),2
         INITIAL    MH117(4,2),120
         INITIAL    MH154(1,1),29
         INITIAL    MH154(2-3,1),2
         INITIAL    MH154(3,2),5
         INITIAL    MX013(1-3,1-2),660100
         INITIAL    MX013(3,2),660150
         INITIAL    MX013(4,1),660125
         INITIAL    MX013(4,2),660200
         INITIAL    MX013(5-7,1-2),760150
         INITIAL    MX013(8,1-2),760200
         INITIAL    MX013(9,1-2),580150
         INITIAL    MX013(10-11,1-2),620150
         INITIAL    MX013(12,1-2),620200
*  TEW-MAL
         INITIAL    MH118(1-2,1),6
         INITIAL    MH118(1,2),8
         INITIAL    MH118(1,3),18
         INITIAL    MH118(1,4),92
         INITIAL    MH118(2,3),24
         INITIAL    MH118(2,4),2
         INITIAL    MH118(3,1),1
         INITIAL    MH118(3,2),210
         INITIAL    MH118(3-6,3),155
         INITIAL    MH118(3-6,4),14
         INITIAL    MH118(4,1),2
         INITIAL    MH118(4,2),30
         INITIAL    MH118(5,1),3
         INITIAL    MH118(5,2),180
         INITIAL    MH118(6,1),4
         INITIAL    MH118(6,2),360
         INITIAL    MH155(1,1),1
         INITIAL    MH155(1,2),3
         INITIAL    MH155(2,1),28
         INITIAL    MX014(1-3,1-4),640100
         INITIAL    MX014(3,2-4),640150
         INITIAL    MX014(4,2-4),920200
         INITIAL    MX014(4,1),640175
         INITIAL    MX014(5-6,1-4),760100
         INITIAL    MX014(7,1-4),760150
         INITIAL    MX014(8,1-4),920200
         INITIAL    XH1,63
         INITIAL    XH2,1
         INITIAL    XH3,180
         INITIAL    XH4,15
         INITIAL    XH5,8
         INITIAL    XH6,18
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(continued)

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         INITIAL     XH7,5
         INITIAL     XH8,500
         INITIAL     XH9,18
         INITIAL     XH10,5
         INITIAL     XH11,15
         INITIAL     XH12,16
         INITIAL     XH13,10
         INITIAL     XH14,15
         INITIAL     XH15,30
         INITIAL     XH16,3
         INITIAL     XH17,5
         INITIAL     XH18,-1
         INITIAL     XH19,2
         INITIAL     XH20,100
         INITIAL     XH21,375
         INITIAL     XH22,5
 5       FUNCTION    RN2   C2
0          50         .999        150
 6       FUNCTION    P1    D10
4          3          5           3          6          7
7          7          8           12         9          12
10         22         11          22         12         30
13         30
 7       FUNCTION    P3    D7
1          1000       2           750        3          500
4          400        5           300        6          200
7          50
 8       FUNCTION    P1    D7
1          25         2           50         3          80
4          100        5           150        6          200
7          300
 9       FUNCTION    FN2   C2
0          150        .999        450
 10      FUNCTION    P1    D4
1          1005       2           18060      3          2015
4          24060
 11      FUNCTION    P1    C13
0          100        1           7          10         4.6
100        2.3        200         1.61       300        1.2
400        .92        500         .69        600        .51
700        .36        800         .22        900        .11
999        .001
 1       FUNCTION    FN1   C2
0          71         1           92
 2       FUNCTION    RN1   C2
0          91         1           122
 3       FUNCTION    FN1   C2
0          121        1           142
 4       FUNCTION    FN1   C2
0          141        1           167
 1       VARIABLE    (C1/60)'24+1
 2       FVARIABLE   FN7+FN9-300
 3       FVARIABLE   FN11*P3
 4       FVARIABLE   FN11*P4
 5       FVARIABLE   FN8+(FN5-100)/2
 6       FVARIABLE   FN11*XH4
 7       FVARIABLE   FN7+FN5-100
 8       FVARIABLE   FN11*XH3
 9       FVARIABLE   XH23*MH41(P2,XH24)+V10
 10      FVARIABLE   XH25*MH42(P2,XH24)
 11      FVARIABLE   XH23*MH38(V1,XH24)+V12
 12      FVARIABLE   XH25*MH39(V1,XH24)
 13      FVARIABLE   60*V14
 14      FVARIABLE   FN11/(XH23*MH38(V1,18)+V15)
 15      FVARIABLE   XH25*MH39(V1,18)
 16      FVARIABLE   (600*(MH36(P15,P2)/P3)+5)/10
 17      FVARIABLE   (600*(MH37(P15,P2)/P3)+5)/10
 18      VARIABLE    M1-1
 19      VARIABLE    M1-P7
 20      VARIABLE    XH26*XH26
 21      FVARIABLE   FN10/100+RN7*V22/1000
 22      VARIABLE    FN10'100
 23      FVARIABLE   (10*(X1*XH27/60)+5)/10
 1       BVARIABLE   X2'L'P6
 2       BVARIABLE   X2'L'P6
 3       BVARIABLE   X2'GE'P6
 24      FVARIABLE   (600*P1/P3+5)/10
 25      FVARIABLE   (600*P1/XH28+5)/10
 26      FVARIABLE   XH18*XH26
 4       BVARIABLE   XH29'GE'V27*XH30'GE'V28
 29      FVARIABLE   4*(P16-1)+P14
 27      VARIABLE    X3/1000
 28      VARIABLE    X3'1000
*
* WEATHER MODULE
* WEATHER PARAMETERS
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(continued)

```
*  P1-COUNTER
*  P2-RANDOM NUMBER COUNTER
*  P3-COUNTER
*  P4-CEILING MATRIX NUMBER
*  P5/VISABILITY MATRIX NUMBER
*  P6-DAY/NIGHT COUNTER
*
 1    GENERATE                           1          6
 2    SPLIT      1     59
 3    SPLIT      1     69
 4    ASSIGN     1     2
 5    ASSIGN     6     0
 6    ASSIGN     3     0
 7    TEST GE    V1    XH5    11
 8    TEST L     V1    XH6    11
 9    ASSIGN     1     3
10    ASSIGN     6     1
11    ASSIGN     2     RN2
12    ASSIGN     3+    1
13    TEST LE    P2,MH1(P3,P1),12
14    SAVEVALUE  31,MH1(P3,1),H
15    ASSIGN     2     RN2
16    ASSIGN     1+    2
17    TEST LE    P1    11     19
18    TEST LE    P2,MH1(P3,P1),16
19    SAVEVALUE  32    FN6    H
20    ASSIGN     1-    3
21    ASSIGN     2     RN2
22    ASSIGN     4,MH1(P3,12)
23    ASSIGN     5,MH1(P3,13)
24    ASSIGN     3     0
25    ASSIGN     3+    1
26    TEST LE    P3    6      28
27    TEST LE    P2,MH*4(P3,P1),25
28    SAVEVALUE  33    P3     H
29    TEST E     P3    1      32
30    SAVEVALUE  34    FN7    H
31    TRANSFER         36
32    TEST NE    P3    2      35
33    SAVEVALUE  34    V7     H
34    TRANSFER         36
35    SAVEVALUE  34    V2     H
36    ASSIGN     3+    P3
37    ASSIGN     3+    P6
38    ASSIGN     3-    1
39    ASSIGN     1     0
40    ASSIGN     2     RN2
41    ASSIGN     1+    1
42    TEST LE    P1    6      44
43    TEST LE    P2,MH*5(P1,P3),41
44    SAVEVALUE  35    P1     H
45    TEST E     P1    7      48
46    SAVEVALUE  36    FN8    H
47    TRANSFER         49
48    SAVEVALUE  36    V5     H
49    SAVEVALUE  25    1      H
50    SAVEVALUE  23    0      H
51    TEST E     XH35  7      55
52    TEST E     XH33  1      55
53    SAVEVALUE  25    0      H
54    SAVEVALUE  23    1      H
55    ASSIGN     1     RN2
56    LOGICS     1
57    ADVANCE    V8
58    TRANSFER         4
59    ASSIGN     3     XH33
60    TEST NE    P3    1      66
61    TEST NE    P3    2      64
62    SAVEVALUE  34    V7     H
63    TRANSFER         65
64    SAVEVALUE  34    V2     H
65    LOGICS     1
66    ASSIGN     1     RN2
67    ADVANCE    V6
68    TRANSFER         59
69    ASSIGN     1     XH35
70    TEST NE    P1    7      72
71    SAVEVALUE  36    V5     H
72    ASSIGN     1     RN2
73    LOGICS     1
74    ADVANCE    V6
75    TRANSFER         69
*
* CONTROL A/C'S LEAVING HOLD AREA ENTERING AIR CONTROLLED APPROACH
*
76    GENERATE                           1          1
```

(continued)

```
 77    SPLIT       1     206
 78    GATE LS     2
 79    LOGICR      3
 80    GATE LS     3
 81    GATE LR     4
* AIR CONTROLLER TAKES CONTROL OF A/C
 82    UNLINK      3     200   1     13    0     79
 83    GATE LS     5
 84    LOGICR      5
 85    TRANSFER          81
*
* CREATE A/C AND LOAD INTO HOLD AREAS
*
 86    GENERATE                                  16
 87    GATE LR     6
 88    LOGICS      6
 89    ASSIGN      1     RN1
 90    ADVANCE     V13
 91    LOGICR      6
* ASSIGN A/C TAIL NUMBER
 92    SAVEVALUE   37+   1     H
 93    ASSIGN      5     XH37
* ASSIGN A/C DESTINATION
 94    ASSIGN      1     RN1
 95    SAVEVALUE   24    0     H
 96    SAVEVALUE   24+   1     H
 97    TEST NE     XH24  XH9   100
 98    TEST G      P1    V11   100
 99    TRANSFER          96
 100   ASSIGN      2     XH24
* ASSIGN A/C TYPE
 101   SAVEVALUE   24    0     H
 102   ASSIGN      1     RN1
 103   SAVEVALUE   24+   1     H
 104   TEST G      P1    V9    107
 105   TEST E      XH24  3     103
 106   SAVEVALUE   24    4     H
 107   ASSIGN      4     XH24
* ASSIGN A/C WEIGHT CLASS AND CATAGORY
 108   ASSIGN      1     RN1
 109   ASSIGN      8     0
 110   ASSIGN      8+    1
 111   TEST LE     P1,MH40(P4,P8),110
 112   ASSIGN      14    P8
 113   ASSIGN      8     4
 114   ASSIGN      1     RN1
 115   ASSIGN      8+    1
 116   TEST LE     P1,MH40(P4,P8),115
 117   ASSIGN      9     P8
 118   ASSIGN      9-    4
* ASSIGN A/C SPEED
 119   ASSIGN      3     FN*14
* LOAD DISPLAY MATRIX
 120   MSAVEVALUE 44+    1     P4    1     H
 121   TEST LE     P2    XH10  210
 122   SAVEVALUE   38+   1     H
 123   MSAVEVALUE 44+    2     P4    1     H
 124   ASSIGN      15    1
 125   ASSIGN      10    P5
 126   ASSIGN      5     XH38
 127   ASSIGN      8     0
 128   ASSIGN      1     0
 129   LOGICS      3
 130   MARK
 131   LINK        3     P10
*
* UNLOAD HOLD AREAS AND LAND A/C
*
 132   ADVANCE     P7
 133   GATE LR     7
 134   UNLINK      P11   198   1     5     P5    199
 135   TEST NE     V19   0     138
 136   MSAVEVALUE 44+    5     P4    1     H
 137   MSAVEVALUE 44+    6     P4    V19   H
 138   SAVEVALUE   39-   1     H
 139   TEST L      XH39,MH43(XH2,11),141
 140   LOGICR      4
 141   ASSIGN      1     P4
 142   MSAVEVALUE 44+    9     P4    1     H
 143   SPLIT       1     150         3
 144   LOGICS      8
 145   ADVANCE     1
 146   TEST GE     XH2   XH11  148
 147   ADVANCE     2
 148   LOGICR      8
 149   TERMINATE
```

(continued)

```
* TAKE OFF A/C
*
 150    ADVANCE     V21
 151    PRIORITY    0
 152    MSAVEVALUE 44+    13    P1    1    H
 153    MARK
 154    ASSIGN      2     C1
 155    SAVEVALUE   40+   1     H
 156    ASSIGN      3     XH40
 157    SPLIT       1     159
 158    LINK        4     P2
 159    GATE LR     9
 160    LOGICS      9
 161    GATE LR     7
 162    LOGICS      7
 163    SAVEVALUE   2     P2
 164    UNLINK      1     176   1     BV1         160
 165    GATE LS     10
 166    LOGICR      7
 167    LOGICR      10
 168    SAVEVALUE   1-    C1
 169    TEST G      XH32  XH14  171
 170    GATE LR     8
 171    TEST NE     V23   0     185
 172    TEST L      V23   XH19  185
 173    MSAVEVALUE 44+    12    P1    X1    H
 174    ADVANCE     X1
 175    TRANSFER          161
 176    SAVEVALUE   1     P6
 177    SAVEVALUE   27    P3    H
 178    LOGICS      10
 179    LINK        P11   P6
 180    LOGICR      7
 181    LOGICR      10
 182    SAVEVALUE   1     0
 183    SAVEVALUE   27    0     H
 184    TRANSFER          169
 185    TEST LE     XH20  XH36  196
 186    TEST LE     XH21  XH34  196
 187    UNLINK      4     198   1     3           199
 188    ADVANCE     1
 189    TEST GE     XH2   XH11  191
 190    ADVANCE     2
 191    LOGICR      9
 192    TEST NE     V18   0     195
 193    MSAVEVALUE 44+    10    P1    1     H
 194    MSAVEVALUE 44+    11    P1    V18   H
 195    TERMINATE
 196    GATE LS     1
 197    TRANSFER          161
 198    TERMINATE
 199    ASSIGN      XH41  101
*
* TEST AND LOAD LANDING SCHEDULE
*
 200    LOGICS      5
 201    TEST LE     M1    XH15  263
 202    SAVEVALUE   39+   1     H
 203    TEST GE     XH39,MH43(XH2,11),210
 204    LOGICS      4
 205    TRANSFER          210
 206    GATE LS     1
 207    LOGICR      1
 208    UNLINK      3     210   ALL   13    1
 209    TRANSFER          206
* DETERMINE LANDING RUNWAY
 210    ASSIGN      1     XH7
 211    PRIORITY    0
 212    ASSIGN      8     0
 213    ASSIGN      1+    1
 214    ASSIGN      1,MH36(P1,P2)
 215    TEST NE     P15   0     220
 216    TEST G      P2    XH10  220
 217    ASSIGN      1     XH7
 218    ASSIGN      1+    1
 219    ASSIGN      1,MH36(P1,1)
 220    TEST GE     V1,MH*1(1,2),242
 221    TEST LE     V1,MH*1(1,3),242
 222    ASSIGN      6     3
 223    ASSIGN      7,MH*1(2,1)
 224    TEST GE     V1,MH*1(2,2),226
 225    TEST G      V1,MH*1(2,3),229
 226    ASSIGN      6,MH*1(2,1)
 227    ASSIGN      7,MH*1(1,1)
 228    ASSIGN      7+    1
 229    TEST G      XH32  XH22  267
```

(continued)

```
230    SAVEVALUE  26     XH31   H
231    SAVEVALUE  26-,MH*1(P6,2),H
232    TEST L     XH26   0      234
233    SAVEVALUE  26     V26    H
234    TEST GE    XH26   180    236
235    SAVEVALUE  26-    360    H
236    TEST G     V20    6400   267
237    ASSIGN     6+     1
238    TEST GE    P6     P7     230
239    TEST NE    P8     0      242
240    ASSIGN     15,MH*1(P8,1)
241    TRANSFER          324
242    TEST E     P15    0      249
243    PRIORITY   2
244    ASSIGN     15     RN5
245    TEST LE    P15    XH8    247
246    TERMINATE
247    MSAVEVALUE 44+    3      P4     1      H
248    TRANSFER          122
249    TEST E     P13    0      258
250    SAVEVALUE  39-    1      H
251    TEST LE    XH39,MH43(XH2,11),253
252    LOGICR     4
253    GATE LR    7
254    UNLINK     1      198    1      10
255    UNLINK     2      198    1      10
256    SPLIT      1      259
257    ASSIGN     13     1
258    LINK       3      P10
259    ADVANCE    XH15
260    UNLINK     3      198    1      10
261    MSAVEVALUE 44+    6      P4     1      H
262    TERMINATE
263    PRIORITY   0      BUFFER
264    UNLINK     3      198    1      10
265    MSAVEVALUE 44+    8      P4     1      H
266    TERMINATE
267    TEST NE    P8     0      277
268    SAVEVALUE  3      V20
269    SAVEVALUE  26     XH31   H
270    SAVEVALUE  26-,MH*1(P8,2),H
271    TEST L     XH26   0      273
272    SAVEVALUE  26     V26    H
273    TEST GE    XH26   180    275
274    SAVEVALUE  26-    360    H
275    SAVEVALUE  3-     V20
276    TEST L     X3     0      237
277    TEST NE    XH23   1      317
278    ASSIGN     16     0
279    ASSIGN     12,MH*1(P6,3)
280    ASSIGN     16+    1
281    TEST LE    P16,MH*1(2,4),237
282    ASSIGN     11     0
283    ASSIGN     11+    1
284    TEST LE    P11    4      289
285    TEST NE    MH*12(P16,P11),0,283
286    SAVEVALUE  42,MH*12(P16,P11),H
287    TEST NE    MX15(XH42,1),1,283
288    TRANSFER          280
289    SAVEVALUE  29     XH34   H
290    SAVEVALUE  30     XH36   H
291    SAVEVALUE  29-,MH*1(1,4),H
292    TEST NE    MH*12(P16,5),0,297
293    SAVEVALUE  42,MH*12(P16,5),H
294    TEST NE    MX15(XH42,1),1,297
295    SAVEVALUE  30-    25     H
296    SAVEVALUE  29-    50     H
297    TEST NE    MH*12(P16,6),0,302
298    SAVEVALUE  42,MH*12(P16,6),H
299    TEST NE    MX15(XH42,1),1,302
300    SAVEVALUE  30-    25     H
301    SAVEVALUE  29-    50     H
302    TEST NE    MH*12(P16,7),0,307
303    SAVEVALUE  42,MH*12(P16,7),H
304    TEST NE    MX15(XH42,1),1,307
305    SAVEVALUE  29-    50     H
306    SAVEVALUE  30-    50     H
307    TEST NE    MH*12(P16,8),0,311
308    SAVEVALUE  42,MH*12(P16,8),H
309    TEST NE    MX15(XH42,1),1,311
310    SAVEVALUE  30-    50     H
311    ASSIGN     12,MH*1(P6,4)
312    SAVEVALUE  42,MH*1(P6,1),H
313    SAVEVALUE  3,MX*12(V29,XH42)
314    TEST NE    BV4    1      317
315    ASSIGN     12,MH*1(P6,3)
```

(continued)

```
 316   TRANSFER         280
 317   ASSIGN     12    0
 318   TEST E     P15   0     320
 319   TERMINATE
 320   ASSIGN     15,MH*1(P6,1)
 321   TEST G     XH32  XH14  324
 322   ASSIGN     8     P6
 323   TRANSFER         237
 324   ASSIGN     1     0
 325   TEST E     P13   1     330
 326   ASSIGN     13    0
 327   PRIORITY   2
 328   LOGICS     3
 329   LINK       3     P10
 330   TEST E     P9    1     335
 331   TEST E     XH23  1     335
 332   ASSIGN     11    2
 333   ASSIGN     7     XH13
 334   TRANSFER         341
 335   ASSIGN     11    1
 336   MSAVEVALUE 38    V1    19    P15   H
 337   TEST GE    XH2   XH11  340
 338   ASSIGN     7     V17
 339   TRANSFER         341
 340   ASSIGN     7     V16
* CALCULATE ETA AND CONFLICTS
 341   ASSIGN     6     P7
 342   ASSIGN     8     0
 343   TEST G     P2    XH10  345
 344   MSAVEVALUE 44+   4     P4    P7    H
 345   ASSIGN     6+    C1
 346   GATE LR    7
 347   LOGICS     7
 348   UNLINK     1     198   1     10
 349   UNLINK     2     198   1     10
 350   SAVEVALUE  2     P6
 351   UNLINK     P11   411   ALL   BV3         416
 352   GATE LS    11
 353   LOGICR     11
 354   UNLINK     P11   401   1     BV2         406
 355   GATE LS    12
 356   LOGICR     12
 357   LOGICR     7
 358   TEST E     X4    0     419
* TRAILING A/C DOES NOT EXIST
 359   TEST NE    X5    0     384
* LEAD A/C EXISTS
 360   ASSIGN     1     0
 361   TEST LE    P9    XH43  373
 362   TEST E     XH43  3     368
 363   ASSIGN     1     6
 364   ASSIGN     1+    XH43
 365   ASSIGN     1-    P9
 366   ASSIGN     1,MH43(XH2,P1)
 367   TRANSFER         373
 368   TEST E     XH43  2     373
 369   ASSIGN     1     9
 370   ASSIGN     1+    XH43
 371   ASSIGN     1-    P9
 372   ASSIGN     1,MH43(XH2,P1)
 373   ASSIGN     1+,MH43(XH2,5)
 374   TEST L     P1    XH17  377
 375   TEST G     CH4   XH16  377
 376   ASSIGN     1     XH17
 377   ASSIGN     1     V24
 378   ASSIGN     1+    X5
 379   TEST NE    P12   1     447
 380   TEST G     P1    P6    384
* CALCULATE WAIT TIME
 381   ASSIGN     1-    P6
 382   ASSIGN     6+    P1
 383   ASSIGN     8+    P1
 384   SPLIT      1     386
 385   LINK       P11   P6
 386   TEST G     P8    0     132
 387   TEST G     P8    XH15  392
 388   GATE LR    7
 389   UNLINK     P11   198   1     5           199
 390   SAVEVALUE  39-   1     H
 391   TRANSFER         263
 392   ADVANCE    P8
 393   MSAVEVALUE 44+   7     P4    P8    H
 394   PRIORITY   2
 395   ASSIGN     8     0
 396   TEST G     XH39,MH43(XH2,11),210
 397   SAVEVALUE  39-   1     H
```

(continued)

```
 398   GATE LR    7
 399   UNLINK     P11   198   1     5              199
 400   LINK       3     P10
 401   SAVEVALUE  4     P6
 402   SAVEVALUE  44    P9    H
 403   SAVEVALUE  28    P3    H
 404   LOGICS     12
 405   LINK       P11   P6
 406   SAVEVALUE  4     0
 407   SAVEVALUE  44    0     H
 408   SAVEVALUE  28    0     H
 409   LOGICS     12
 410   TRANSFER         355
 411   SAVEVALUE  5     P6
 412   SAVEVALUE  43    P9    H
 413   TEST E     W351  1     415
 414   LOGICS     11
 415   LINK       P11   P6
 416   SAVEVALUE  5     0
 417   SAVEVALUE  43    0     H
 418   TRANSFER         353
*
* TRAILING A/C EXISTS
*
 419   TEST E     X5    0     445
* TEST TRAILING A/C
 420   ASSIGN     1     0
 421   TEST L     P6    X4    346
 422   TEST LE    XH44  P9    434
 423   TEST E     P9    3     429
 424   ASSIGN     1     6
 425   ASSIGN     1+    P9
 426   ASSIGN     1-    XH44
 427   ASSIGN     1,MH43(XH2,P1)
 428   TRANSFER         434
 429   TEST E     P9    2     434
 430   ASSIGN     1     9
 431   ASSIGN     1+    P9
 432   ASSIGN     1-    XH44
 433   ASSIGN     1,MH43(XH2,P1)
 434   ASSIGN     1+,MH43(XH2,5)
 435   TEST L     P1    XH17  438
 436   TEST G     CH4   XH16  438
 437   ASSIGN     1     XH17
 438   ASSIGN     1     V25
 439   ASSIGN     1+    P6
 440   TEST G     P1    X4    384
* CALCULATE WAIT TIME
 441   ASSIGN     8+    X4
 442   ASSIGN     8-    P6
 443   ASSIGN     6     X4
 444   TRANSFER         346
* LEAD A/C EXISTS
 445   ASSIGN     12    1
 446   TRANSFER         360
 447   ASSIGN     12    0
 448   SAVEVALUE  43    0     H
 449   SAVEVALUE  5     0
 450   TEST G     P1    P6    420
* CALCULATE WAIT TIME
 451   ASSIGN     1-    P6
 452   ASSIGN     6+    P1
 453   ASSIGN     8+    P1
 454   TRANSFER         420
*
* FACILITIES OUTAGE MODULE
*
 455   GENERATE                     1              4     F
 456   ASSIGN     2+    1
 457   TEST G     P2    XH1   472
 458   LOGICS     2
 459   SAVEVALUE  2     1     H
 460   GATE LS    13
 461   LOGICR     13
 462   SAVEVALUE  2     0     H
 463   SAVEVALUE  2+    1     H
 464   TEST L     XH2   XH12  460
 465   ASSIGN     1     0
 466   ASSIGN     1+    1
 467   TEST LE    P1    4     460
 468   ASSIGN     2,MH43(XH2,P1)
 469   TEST NE    P2    0     466
 470   TEST E     MX15(P2,1),0,466
 471   TRANSFER         463
 472   SPLIT      1     456
 473   ASSIGN     3,MX15(P2,2)
```

(continued)

```
 474   ASSIGN      4,MX15(P2,3)
 475   MSAVEVALUE 15     P2    1     1
 476   ASSIGN     1      RN4
 477   ADVANCE    V3
 478   LOGICS     13
 479   MSAVEVALUE 15     P2    1     0
 480   ASSIGN     1      RN4
 481   ADVANCE    V4
 482   LOGICS     1
 483   LOGICS     13
 484   TRANSFER          475
*
* MODEL RUN CONSTRAINTS
*
 485   GENERATE   1440                          1
 486   TERMINATE  1
       START      1                 1
```

Core Requirements Exceeded

Block printout prints, for each GPSS statement number, the number of transactions currently at each block, and the total number of transactions passing through that block.

```
ERROR NO.  599
TRANS    16 FROM    457 TO    472 CLOCK          1  TERMINATIONS TO GO         1
BLOCK COUNTS
```

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
1	0	1	11	0	1	21	0	1	31	0	1	41	0	7
2	0	2	12	0	6	22	0	1	32	0	0	42	0	7
3	0	2	13	0	6	23	0	1	33	0	0	43	0	6
4	0	1	14	0	1	24	0	1	34	0	0	44	0	1
5	0	1	15	0	1	25	0	1	35	0	0	45	0	1
6	0	1	16	0	2	26	0	1	36	0	1	46	0	1
7	0	1	17	0	2	27	0	1	37	0	1	47	0	1
8	0	0	18	0	2	28	0	1	38	0	1	48	0	0
9	0	0	19	0	1	29	0	1	39	0	1	49	0	1
10	0	0	20	0	1	30	0	1	40	0	1	50	0	1
BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
51	0	1	61	0	0	71	0	0	81	0	0	91	0	0
52	0	1	62	0	0	72	0	1	82	0	0	92	0	0
53	0	1	63	0	0	73	0	1	83	0	0	93	0	0
54	0	1	64	0	0	74	1	1	84	0	0	94	0	0
55	0	1	65	0	0	75	0	0	85	1	2	95	0	0
56	0	1	66	0	1	76	0	1	86	0	1	96	0	0
57	1	1	67	1	1	77	0	2	87	1	1	97	0	0
58	0	0	68	0	0	78	1	1	88	0	0	98	0	0
59	0	1	69	0	1	79	0	0	89	0	0	99	0	0
60	0	1	70	0	1	80	0	0	90	0	0	100	0	0
BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
101	0	0	111	0	0	121	0	0	131	0	0	141	0	0
102	0	0	112	0	0	122	0	0	132	0	0	142	0	0
103	0	0	113	0	0	123	0	0	133	0	0	143	0	0
104	0	0	114	0	0	124	0	0	134	0	0	144	0	0
105	0	0	115	0	0	125	0	0	135	0	0	145	0	0
106	0	0	116	0	0	126	0	0	136	0	0	146	0	0
107	0	0	117	0	0	127	0	0	137	0	0	147	0	0
108	0	0	118	0	0	128	0	0	138	0	0	148	0	0
109	0	0	119	0	0	129	0	0	139	0	0	149	0	0
110	0	0	120	0	0	130	0	0	140	0	0	150	0	0
BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
151	0	0	161	0	0	171	0	0	181	0	0	191	0	0
152	0	0	162	0	0	172	0	0	182	0	0	192	0	0
153	0	0	163	0	0	173	0	0	183	0	0	193	0	0
154	0	0	164	0	0	174	0	0	184	0	0	194	0	0
155	0	0	165	0	0	175	0	0	185	0	0	195	0	0
156	0	0	166	0	0	176	0	0	186	0	0	196	0	0
157	0	0	167	0	0	177	0	0	187	0	0	197	0	0
158	0	0	168	0	0	178	0	0	188	0	0	198	0	0
159	0	0	169	0	0	179	0	0	189	0	0	199	0	0
160	0	0	170	0	0	180	0	0	190	0	0	200	0	0

(continued)

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
201	0	0	211	0	0	221	0	0	231	0	0	241	0	0
202	0	0	212	0	0	222	0	0	232	0	0	242	0	0
203	0	0	213	0	0	223	0	0	233	0	0	243	0	0
204	0	0	214	0	0	224	0	0	234	0	0	244	0	0
205	0	1	215	0	0	225	0	0	235	0	0	245	0	0
206	0	1	216	0	0	226	0	0	236	0	0	246	0	0
207	0	1	217	0	0	227	0	0	237	0	0	247	0	0
208	1	1	218	0	0	228	0	0	238	0	0	248	0	0
209	0	0	219	0	0	229	0	0	239	0	0	249	0	0
210	0	0	220	0	0	230	0	0	240	0	0	250	0	0

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
251	0	0	261	0	0	271	0	0	281	0	0	291	0	0
252	0	0	262	0	0	272	0	0	282	0	0	292	0	0
253	0	0	263	0	0	273	0	0	283	0	0	293	0	0
254	0	0	264	0	0	274	0	0	284	0	0	294	0	0
255	0	0	265	0	0	275	0	0	285	0	0	295	0	0
256	0	0	266	0	0	276	0	0	286	0	0	296	0	0
257	0	0	267	0	0	277	0	0	287	0	0	297	0	0
258	0	0	268	0	0	278	0	0	288	0	0	298	0	0
259	0	0	269	0	0	279	0	0	289	0	0	299	0	0
260	0	0	270	0	0	280	0	0	290	0	0	300	0	0

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
301	0	0	311	0	0	321	0	0	331	0	0	341	0	0
302	0	0	312	0	0	322	0	0	332	0	0	342	0	0
303	0	0	313	0	0	323	0	0	333	0	0	343	0	0
304	0	0	314	0	0	324	0	0	334	0	0	344	0	0
305	0	0	315	0	0	325	0	0	335	0	0	345	0	0
306	0	0	316	0	0	326	0	0	336	0	0	346	0	0
307	0	0	317	0	0	327	0	0	337	0	0	347	0	0
308	0	0	318	0	0	328	0	0	338	0	0	348	0	0
309	0	0	319	0	0	329	0	0	339	0	0	349	0	0
310	0	0	320	0	0	330	0	0	340	0	0	350	0	0

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
351	0	0	361	0	0	371	0	0	381	0	0	391	0	0
352	0	0	362	0	0	372	0	0	382	0	0	392	0	0
353	0	0	363	0	0	373	0	0	383	0	0	393	0	0
354	0	0	364	0	0	374	0	0	384	0	0	394	0	0
355	0	0	365	0	0	375	0	0	385	0	0	395	0	0
356	0	0	366	0	0	376	0	0	386	0	0	396	0	0
357	0	0	367	0	0	377	0	0	387	0	0	397	0	0
358	0	0	368	0	0	378	0	0	388	0	0	398	0	0
359	0	0	369	0	0	379	0	0	389	0	0	399	0	0
360	0	0	370	0	0	380	0	0	390	0	0	400	0	0

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
401	0	0	411	0	0	421	0	0	431	0	0	441	0	0
402	0	0	412	0	0	422	0	0	432	0	0	442	0	0
403	0	0	413	0	0	423	0	0	433	0	0	443	0	0
404	0	0	414	0	0	424	0	0	434	0	0	444	0	0
405	0	0	415	0	0	425	0	0	435	0	0	445	0	0
406	0	0	416	0	0	426	0	0	436	0	0	446	0	0
407	0	0	417	0	0	427	0	0	437	0	0	447	0	0
408	0	0	418	0	0	428	0	0	438	0	0	448	0	0
409	0	0	419	0	0	429	0	0	439	0	0	449	0	0
410	0	0	420	0	0	430	0	0	440	0	0	450	0	0

(continued)

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
451	0	0	461	0	0	471	0	0	481	0	0			
452	0	0	462	0	0	472	0	14	482	0	0			
453	0	0	463	0	0	473	0	7	483	0	0			
454	0	0	464	0	0	474	0	7	484	0	0			
455	0	1	465	0	0	475	0	7	485	0	0			
456	0	8	466	0	0	476	0	7	486	0	0			
457	0	8	467	0	0	477	7	7						
458	0	0	468	0	0	478	0	0						
459	0	0	469	0	0	479	0	0						
460	0	0	470	0	0	480	0	0						

CURRENT EVENTS CHAIN

TRANS	BDT	BLOCK	PR	SF	NBA	SET	MARK-TIME	P1	P2	P3	P4	SI	TI	DI	CI	MC	PC	PF
2	1	77			78	8	1	0				1		1	2			
8		209			206	2	1	0				1		1	2			
9	1	86			87	9	-2	0	0	0	0	1		1	2			
								0	0	0	0							
								0	0	0	0							
								0	0	0	0							
16		472			456	4	1	0	8	0	0				2			

Lists the transactions that are to be processed at the time the printout was presented.
Detailed explanation of this printout is presented in the GPSS user's manual.

FUTURE EVENTS CHAIN

TRANS	BDT	BLOCK	PR	SF	NBA	SET	MARK-TIME	P1	P2	P3	P4	SI	TI	DI	CI	MC	PC	PF
7	9	74			75	6	1	585	0	0	0	--			4			
								0	0									
6	10	67			68	1	1	537	0	1	0				4			
								0	0									
3	14	90			91	3	1	219	0	0	0				4			
								0	0	0	0							
								0	0	0	0							
								0	0	0	0							
1	796	57			58	7	1	17	436	1	12				4			
								13	0									
5	1440				485	5		0							4			
15	13211	477			478	16	1	585	7	24600	534				4			
14	15336	477			478	15	1	537	6	24600	534				4			
10	34335	477			478	11	1	567	2	60300	318				4			
11	41390	477			478	12	1	502	3	60300	318				4			
12	50484	477			478	13	1	436	4	60300	318				4			
4	92386	477			478	10	1	219	1	60300	318				4			
13	319647	477			478	14	1	17	5	72300	402				4			

Lists the transactions that are to be processed at a future time.
Details of this printout are presented in the GPSS user's manual.

(continued)

LOGIC SWITCH - SET (ON) STATUS

SWITCH	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	FINI2														

Lists of logic switchs that are in the set position at present time.

CONTENTS OF HALFWORD SAVEVALUES (NON-ZERO)

SAVEVALUE NR,	VALUE	NR,	VALUE	NR,	VALUE	NR,	VALUE	NR,	VALUE	NR,	VALUE	NR,	VALUE	NR,	VALUE
FACIL	63	ARSEP	1	WTCHG	180	WTVAR	15	DAYST	8	DAYEN	18	RUNWY	5	DIVRT	500
AIRPT	18	HOLD	5	NORAD	15	RADDW	16	TOF	10	WNMAX	15	MAXTM	30	TAKQU	3
LNDST	5	MNONE	-1	LNDSP	2	TAKVS	100	TAKCL	375	CALM	5	VFRWT	1	WNDIR	90
WNVEL	7	CEILP	1	CEIL	1000	VISAP	7	VISAB	300						

List of savevalues that are not zero and their values.

MATRIX HALFWORD SAVEVALUE(IRVL

Wind Direction in Degrees

Ceiling Matrix

Visibility Matrix

	COL. 1	NT 2	DY 3	NT 4	DY 5	NT 6	DY 7	NT 8	DY 9	NT 10	DY 11	12	13
Calm 1	360	7	1	1000	1000	1000	1000	1000	1000	1000	1000	2	3
N 2	0	96	58	61	7	576	448	839	777	1000	990	4	5
NNE 3	22	128	85	152	76	704	510	891	753	956	995	6	7
NE 4	45	163	118	113	29	510	324	755	639	981	979	8	9
ENE 5	67	198	169	82	441	494	0	724	770	981	992	10	11
E 6	90	232	263	167	49	642	437	776	820	976	996	12	13
ESE 7	112	254	348	207	47	671	0	866	804	994	1000	14	15
SE 8	135	272	398	237	66	777	680	935	962	993	995	16	17
SSE 9	157	296	425	153	101	736	641	939	924	1000	995	18	19
S 10	180	365	489	109	53	757	456	949	803	1000	985	20	21
SSW 11	202	424	550	58	20	569	211	845	602	1000	998	22	23
SW 12	225	496	591	48	17	479	195	779	510	998	1000	24	25
WSW 13	247	616	663	19	15	439	302	827	645	999	992	26	27
W 14	270	776	777	69	14	312	211	651	498	990	966	28	29
WNW 15	292	836	874	33	101	295	184	649	439	974	977	30	31
NW 16	315	937	958	26	20	396	225	734	554	996	993	32	33
NNW 17	337	1000	1000	30	13	413	835	835	658	1000	1000	34	35
18	0	0	0	0	0	0	0	0	0	0	0	0	0
	Wind direction in degrees	Number of cumulative occurrences, out of 1000, of wind direction in Day/Night		3 Knots		7 Knots		12 Knots		22 Knots		Default = 30 Knots	

Wind Velocity

(continued)

MATRIX HALFWORD SAVEVALUE 2

Ceiling		NT	DY	NT	DY	NT	DY	NT	DY	NT	DY
	COL.	1	2	3	4	5	6	7	8	9	10
1000'	1	857	857	0	0	0	0	0	0	0	0
750'	2	877	877	0	0	0	0	0	0	0	0
500'	3	918	918	0	0	0	0	0	0	0	0
400'	4	938	938	0	0	0	0	0	0	0	0
300'	5	979	979	0	0	0	0	0	0	0	0
200'	6	979	979	0	0	0	0	0	0	0	0
Default = 50'											
Wind Velocity		3 Knots		2 Knots		12 Knots		22 Knots		30 Knots	

Ceiling Matrix for Wind Calm

MATRIX HALFWORD SAVEVALUE 3

Visibility in Miles		NT	DY	NT	DY	NT	DY	NT	DY	NT	DY	NT	DY	NT	DY
	COL.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
.25	1	24	24	0	0	0	0	0	0	500	500	0	0	1000	1000
.50	2	48	48	0	0	0	0	0	0	500	500	0	0	1000	1000
.80	3	48	48	0	0	0	0	0	0	500	500	0	0	1000	1000
1.00	4	72	72	0	0	0	0	1000	1000	1000	1000	0	0	1000	1000
1.50	5	119	119	0	0	0	0	1000	1000	1000	1000	0	0	1000	1000
2.00	6	143	143	0	0	1000	1000	1000	1000	1000	1000	0	0	1000	1000
Default = 3.00															
Ceiling		1000'		750'		500'		400'		300'		200'		50'	

Visibility Matrix for Wind Calm

MATRIX HALFWORD SAVEVALUE 4

Ceiling		NT	DY	NT	DY	NT	DY	NT	DY	NT	DY
	COL.	1	2	3	4	5	6	7	8	9	10
1000'	1	825	733	798	841	762	752	714	640	1000	0
750'	2	850	800	857	911	878	883	876	820	1000	750
500'	3	850	833	881	943	901	905	933	910	1000	750
400'	4	850	866	914	956	948	956	962	944	1000	1000
300'	5	875	900	950	981	977	992	991	989	1000	1000
200'	6	950	967	977	981	994	1000	1000	989	1000	1000
Default = 50'											
Wind Velocity		3 Knots		7 Knots		12 Knots		22 Knots		30 Knots	

Ceiling matrix for wind N

MATRIX HALFWORD SAVEVALUE 5

Visibility in Miles		NT	DY	NT	DY	NT	DY	NT	DY	NT	DY	NT	DY	NT	DY
	COL.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
.25	1	0	0	0	0	0	0	0	71	0	0	63	0	455	400
.50	2	2	0	0	60	0	59	0	143	0	0	313	333	728	600
.80	3	2	0	17	80	56	118	91	143	48	71	501	333	819	800
1.00	4	6	6	51	120	111	176	136	143	238	286	564	333	910	1000
1.50	5	6	13	85	200	222	294	227	214	381	500	814	667	910	1000
2.00	6	12	16	171	260	389	412	485	429	810	500	877	1000	1000	1000
Default = 3.00															
Ceiling		1000'		750'		500'		400'		300'		200'		50'	

Visibility matrix for wind N

(continued)

MATRIX HALFWORD SAVEVALUE 6

	COL. 1	2	3	4	5	6	7	8	9	10
ROW 1	771	867	638	744	628	553	625	813	1000	1000
2	771	933	732	849	857	766	750	983	1000	1000
3	800	933	764	860	884	809	72	938	1000	1000
4	800	1000	795	884	907	894	875	979	1000	1000
5	829	1000	874	953	977	979	958	1000	1000	1000
6	914	1000	939	977	1000	1000	1000	1000	1000	1000

Same as matrix 2

Ceiling matrix for wind NNE

MATRIX HALFWORD SAVEVALUE 7

	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14
ROW 1	0	0	0	0	0	0	0	250	0	0	231	0	545	500
2	0	7	0	0	0	0	0	375	0	0	385	333	818	1000
3	0	7	0	0	0	167	0	500	63	0	462	667	818	1000
4	0	7	0	0	0	167	0	500	63	273	462	1000	909	1000
5	13	7	40	37	125	167	0	625	188	273	846	1000	909	1000
6	20	14	120	74	500	500	0	750	688	909	1000	1000	1000	1000

Same as matrix 3

Visibility matrix for wind NNE

MATRIX HALFWORD SAVEVALUE 8

	COL. 1	2	3	4	5	6	7	8	9	10
ROW 1	793	857	549	629	492	547	586	593	200	200
2	862	857	637	743	651	693	776	765	800	800
3	862	857	725	757	762	747	810	852	800	1000
4	897	857	775	814	794	800	879	963	800	1000
5	931	1000	804	857	873	893	914	975	800	1000
6	931	1000	902	943	1000	960	966	1000	1000	1000

Same as matrix 2

Ceiling matrix for wind NE

MATRIX HALFWORD SAVEVALUE 9

	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14
ROW 1	0	7	0	0	56	0	0	0	91	0	182	0	357	714
2	0	7	57	0	56	0	0	59	91	0	273	154	643	857
3	7	7	57	0	56	0	0	59	91	83	409	385	714	857
4	7	7	57	54	56	83	167	176	91	167	500	538	929	857
5	7	29	57	81	56	250	250	294	91	417	545	769	929	857
6	21	36	200	270	222	583	333	647	455	750	773	846	929	1000

Same as matrix 3

Visibility matrix for wind NE

(continued)

MATRIX HALFWORD SAVEVALUE 10

	COL. 1	2	3	4	5	6	7	8	9	10
ROW 1	762	800	575	764	644	844	576	695	200	333
2	857	613	0	831	763	877	833	829	800	667
3	905	933	689	872	780	902	879	878	1000	1000
4	905	933	755	905	831	918	924	951	1000	1000
5	905	933	783	939	898	959	[illegible]	988	1000	1000
6	952	1000	906	986	949	984	985	1000	1000	1000

Same as matrix 2

Ceiling matrix for wind ENE

MATRIX HALFWORD SAVEVALUE 11

	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14
ROW 1	0	3	0	0	0	0	77	0	0	154	105	83	667	0
2	0	10	30	77	0	0	154	0	111	308	263	250	733	0
3	0	17	30	115	0	0	231	0	111	385	526	417	733	0
4	0	24	61	115	0	63	308	77	111	538	632	500	1000	0
5	19	31	182	115	0	125	385	77	444	769	789	750	1000	0
6	39	49	303	221	71	500	462	692	667	846	947	833	1000	0

Same as matrix 3

Visibility matrix for wind ENE

MATRIX HALFWORD SAVEVALUE 12

	COL. 1	2	3	4	5	6	7	8	9	10
ROW 1	756	676	650	885	394	891	531	826	1000	333
2	829	824	744	916	606	925	796	926	167	333
3	854	882	786	916	667	944	837	942	1000	333
4	854	882	829	939	758	959	918	975	1000	667
5	878	941	880	943	788	959	1000	1000	1000	1000
6	976	971	949	966	909	993	1000	1000	1000	1000

Same as matrix 2

Ceiling matrix for wind E

MATRIX HALFWORD SAVEVALUE 13

	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14
ROW 1	0	0	0	0	67	0	0	0	0	0	438	188	400	583
2	7	2	57	29	133	0	0	133	250	143	688	563	900	750
3	14	2	57	29	133	0	0	133	250	286	750	688	900	750
4	27	5	57	59	133	0	0	267	333	286	813	813	0	833
5	34	13	143	118	333	222	83	400	333	429	875	875	0	833
6	55	37	314	324	667	778	333	800	582	714	938	938	1000	1000

Same as matrix 3

Visibility matrix for wind E

(continued)

MATRIX HALFWORD SAVEVALUE 14

	COL. 1	2	3	4	5	6	7	8	9	10
ROW 1	758	724	675	896	813	930	286	902	1000	1000
2	788	793	727	922	675	961	571	959	1000	1000
3	788	828	805	942	906	969	619	975	1000	1000
4	618	697	844	971	938	987	762	984	1000	1000
5	848	931	883	979	938	991	857	1000	1000	1000
6	909	931	961	996	969	996	905	1000	1000	1000

Same as matrix 2

Ceiling matrix for wind ESE

MATRIX HALFWORD SAVEVALUE 15

	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14
ROW 1	0	0	0	0	0	0	0	71	0	0	200	200	1000	250
2	0	2	0	91	0	0	0	71	167	167	600	600	1000	750
3	0	5	0	91	0	0	0	214	333	167	800	800	1000	750
4	0	12	231	91	0	0	250	286	500	167	900	1000	1000	1000
5	0	18	231	182	125	0	500	643	667	333	1000	1000	1000	1000
6	18	29	308	500	250	0	750	929	1000	1000	1000	1000	1000	1000

Same as matrix 3

Visibility matrix for wind ESE

MATRIX HALFWORD SAVEVALUE 16

	COL. 1	2	3	4	5	6	7	8	9	10
ROW 1	879	956	720	964	773	942	875	667	1000	0
2	879	958	853	996	909	981	875	917	1000	0
3	909	1000	893	996	1000	981	875	1000	1000	0
4	970	1000	907	996	1000	990	1000	1000	1000	500
5	1000	1000	933	996	1000	990	1000	1000	1000	1000
6	1000	1000	973	1000	1000	990	1000	1000	1000	1000

Same as matrix 2

Ceiling matrix for wind SE

MATRIX HALFWORD SAVEVALUE 17

	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14
ROW 1	9	0	0	0	167	0	0	0	333	0	333	1000	1000	1000
2	9	0	0	0	333	0	0	0	333	0	333	1000	1000	1000
3	9	6	0	0	500	0	0	0	333	0	333	1000	1000	1000
4	18	6	0	71	667	0	0	0	333	0	1000	1000	1000	1000
5	27	6	0	143	667	0	250	0	333	0	1000	1000	1000	1000
6	106	35	143	214	667	500	250	500	1000	0	1000	1000	1000	1000

Same as matrix 3

Visibility matrix for wind SE

(continued)

MATRIX HALFWORD SAVEVALUE 18

	COL. 1	2	3	4	5	6	7	8	9	10
ROW 1	0	1000	817	935	781	893	800	643	1000	1000
2	750	1000	946	981	938	964	900	929	1000	1000
3	857	1000	957	981	938	964	900	1000	1000	1000
4	893	1000	968	991	969	1000	900	1000	1000	1000
5	929	1000	978	991	969	1000	900	1000	1000	1000
6	1000	989	1000	1000	1000	1000	1000	1000	1000	1000

Same as matrix 2

Ceiling matrix for wind SSE

MATRIX HALFWORD SAVEVALUE 19

	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14
ROW 1	0	0	56	0	0	0	0	0	0	1000	0	1000	1000	1000
2	0	0	56	0	0	0	0	0	0	1000	400	1000	1000	1000
3	0	6	111	0	0	0	0	0	0	1000	600	1000	1000	1000
4	0	11	111	385	0	0	333	667	0	1000	800	1000	1000	1000
5	0	11	111	692	0	0	333	1000	1000	1000	1000	1000	1000	1000
6	1000	28	278	1000	250	0	667	1000	1000	1000	1000	1000	1000	1000

Same as matrix 3

Visibility matrix for wind SSE

MATRIX HALFWORD SAVEVALUE 20

	COL. 1	2	3	4	5	6	7	8	9	10
ROW 1	800	828	987	947	825	957	1000	965	1000	1000
2	891	862	948	979	918	981	1000	1000	1000	1000
3	927	1000	960	984	959	981	1000	1000	1000	1000
4	945	1000	979	989	990	994	1000	1000	1000	1000
5	964	1000	988	995	1000	1000	1000	1000	1000	1000
6	1000	1000	1000	995	1000	1000	1000	1000	1000	1000

Same as matrix 2

Ceiling matrix for wind S

MATRIX HALFWORD SAVFVALUE 21

	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14
ROW 1	0	0	0	0	0	0	0	0	0	0	0	1000	1000	1000
2	2	0	0	0	0	0	0	0	0	0	167	1000	1000	1000
3	5	0	0	0	0	0	0	333	0	0	333	1000	1000	1000
4	7	0	0	0	0	0	0	667	0	500	500	1000	1000	1000
5	11	0	29	727	0	0	0	667	200	500	500	1000	1000	1000
6	20	11	88	909	100	600	500	1000	600	1000	667	1000	1000	1000

Same as matrix 3

Visibility matrix for wind S

(continued)

MATRIX HALFWORD SAVEVALUE 22

	COL. 1	2	3	4	5	6	7	8	9	10
ROW 1	960	889	891	940	866	959	955	971	1000	1000
2	960	1000	950	952	975	994	985	989	1000	1000
3	960	1000	968	976	983	1000	985	1000	1000	1000
4	960	1000	982	1000	983	1000	1000	1000	1000	1000
5	960	1000	991	1000	992	1000	1000	1000	1000	1000
6	1000	1000	995	1000	1000	1000	1000	1000	1000	1000

Same as matrix 2

Ceiling matrix for wind SSW

MATRIX HALFWORD SAVEVALUE 23

	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14
ROW 1	0	0	0	0	0	0	0	0	0	1000	333	1000	0	1000
2	3	0	0	0	0	0	0	0	0	1000	333	1000	0	1000
3	3	0	0	0	0	0	0	0	0	1000	333	1000	0	1000
4	3	0	0	0	0	0	0	0	0	1000	333	1000	1000	1000
5	3	0	71	0	200	0	0	0	333	1000	333	1000	1000	1000
6	5	7	107	1000	400	200	250	0	667	1000	1000	1000	1000	1000

Same as matrix 3

Visibility matrix for wind SSW

MATRIX HALFWORD SAVEVALUE 24

	COL. 1	2	3	4	5	6	7	8	9	10
ROW 1	1000	1000	930	981	930	958	965	986	1000	1000
2	1000	1000	965	1000	975	989	983	986	1000	1000
3	1000	1000	974	1000	981	989	991	1000	1000	1000
4	1000	1000	982	1000	994	1000	991	1000	1000	1000
5	1000	1000	987	1000	994	1000	1000	1000	1000	1000
6	1000	1000	991	1000	994	1000	1000	1000	1000	1000

Same as matrix 2

Ceiling matrix for wind SW

MATRIX HALFWORD SAVEVALUE 25

	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14
ROW 1	2	0	0	0	0	1000	0	1000	0	1000	667	1000	1000	1000
2	2	0	0	0	0	1000	0	1000	0	1000	1000	1000	1000	1000
3	2	0	0	0	0	1000	0	1000	0	1000	1000	1000	1000	1000
4	2	0	0	0	0	1000	0	1000	0	1000	1000	1000	1000	1000
5	2	0	0	0	250	1000	1000	1000	1000	1000	1000	1000	1000	1000
6	14	0	118	167	250	1000	1000	1000	1000	1000	1000	1000	1000	1000

Same as matrix 3

Visibility matrix for wind SW

(continued)

MATRIX HALFWORD SAVEVALUE 26

	COL. 1	2	3	4	5	6	7	8	9	10
ROW 1	944	1000	935	947	953	967	980	995	1000	1000
2	944	1000	973	980	974	1000	993	995	1000	1000
3	944	1000	976	987	985	1000	1000	995	1000	1000
4	944	1000	984	987	988	1000	1000	1000	1000	1000
5	944	1000	995	993	997	1000	1000	1000	1000	1000
6	944	1000	995	993	1000	1000	1000	1000	1000	1000

Same as matrix 2

Ceiling matrix for wind WSW

MATRIX HALFWORD SAVEVALUE 27

	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14
ROW 1	0	0	0	0	0	0	0	0	0	0	0	1000	0	0
2	0	0	0	0	0	0	0	1000	0	1000	1000	1000	1000	1000
3	0	2	43	0	0	0	0	1000	0	1000	1000	1000	1000	1000
4	0	2	43	0	0	0	286	1000	0	1000	1000	1000	1000	1000
5	1	2	130	0	500	0	286	1000	1000	1000	1000	1000	1000	1000
6	5	8	174	182	500	0	857	1000	1000	1000	1000	1000	1000	1000

Same as matrix 3

Visibility matrix for wind WSW

MATRIX HALFWORD SAVEVALUE 28

	COL. 1	2	3	4	5	6	7	8	9	10
ROW 1	892	1000	964	982	989	996	997	995	875	996
2	973	1000	985	994	1000	996	1000	997	1000	996
3	946	1000	985	994	1000	996	1000	997	1000	1000
4	1000	1000	990	994	1000	1000	1000	1000	1000	1000
5	1000	1000	995	1000	1000	1000	1000	1000	1000	1000
6	1000	1000	995	1000	1000	1000	1000	1000	1000	1000

Same as matrix 2

Ceiling matrix for wind W

MATRIX HALFWORD SAVEVALUE 29

	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14
ROW 1	0	0	0	0	0	0	0	0	0	0	1000	1000	0	1000
2	0	0	0	0	0	0	0	0	0	0	1000	1000	1000	1000
3	0	0	0	0	0	0	0	0	0	0	1000	1000	1000	1000
4	1	0	91	0	0	0	0	0	0	0	1000	1000	1000	1000
5	1	2	91	333	1000	0	0	1000	0	0	1000	1000	1000	1000
6	5	7	182	333	1000	0	500	1000	0	0	1000	1000	1000	1000

Same as matrix 3

Visibility matrix for wind W

(continued)

MATRIX HALFWORD SAVEVALUE 30

	COL. 1	2	3	4	5	6	7	8	9	10
ROW 1	626	963	953	968	976	967	996	995	1000	1000
2	1000	1000	967	968	986	978	1000	1000	1000	1000
3	1000	1000	972	976	986	983	1000	1000	1000	1000
4	1000	1000	981	984	990	989	1000	1000	1000	1000
5	1000	1000	991	992	993	1000	1000	1000	1000	1000
6	1000	1000	1000	992	997	1000	1000	1000	1000	1000

Same as matrix 2

Ceiling matrix for wind WNW

MATRIX HALFWORD SAVEVALUE 31

	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14
ROW 1	0	0	0	0	0	0	0	0	0	0	333	1000	1000	1000
2	0	0	0	0	0	0	0	0	0	0	333	1000	1000	1000
3	0	1	0	0	0	0	333	500	333	333	333	1000	1000	1000
4	0	1	111	0	0	0	333	500	333	333	667	1000	1000	1000
5	0	1	222	250	0	0	667	1000	667	667	1000	1000	1000	1000
6	5	7	222	500	500	1000	1000	1000	1000	667	1000	1000	1000	1000

Same as matrix 3

Visibility matrix for wind WNW

MATRIX HALFWORD SAVEVALUE 32

	COL. 1	2	3	4	5	6	7	8	9	10
ROW 1	947	833	937	888	960	965	969	974	1000	1000
2	947	917	952	944	988	980	990	989	1000	1000
3	947	917	956	976	992	985	995	996	1000	1000
4	947	1000	967	984	1000	985	1000	996	1000	1000
5	947	1000	993	992	1000	995	1000	0	1000	1000
6	947	1000	996	992	1000	1000	1000	1000	1000	1000

Same as matrix 2

Ceiling matrix for wind NW

MATRIX HALFWORD SAVEVALUE 33

	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14
ROW 1	0	2	0	0	0	0	167	0	0	0	0	0	500	1000
2	0	3	0	67	0	0	167	500	125	0	0	0	500	1000
3	1	3	0	67	0	0	333	500	125	250	0	0	1000	1000
4	1	3	0	133	333	143	500	500	375	500	0	0	1000	1000
5	6	5	67	200	333	286	500	500	500	500	1000	0	1000	1000
6	10	12	200	267	333	571	500	1000	750	750	1000	1000	1000	1000

Same as matrix 3

Visibility matrix for wind NW

(continued

MATRIX HALFWORD SAVEVALUE 34

ROW	COL. 1	2	3	4	5	6	7	8	9	10
1	786	1000	903	828	918	879	934	962	1000	1000
2	786	1000	938	892	964	935	974	1000	1000	1000
3	786	1000	955	946	969	972	987	1000	1000	1000
4	786	1000	983	968	974	991	1000	1000	1000	1000
5	786	1000	994	989	990	1000	1000	1000	1000	1000
6	1000	1000	1000	989	1000	1000	1000	1000	1000	1000

Same as matrix 2

Ceiling matrix for wind NNW

MATRIX HALFWORD SAVEVALUE 35

ROW	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	0	4	0	0	0	111	0	0	0	0	0	1000	1000	0
2	0	4	0	0	0	111	0	250	0	333	167	1000	1000	1000
3	0	4	0	0	0	222	0	250	0	667	333	1000	1000	1000
4	0	4	125	0	200	333	143	250	0	667	333	1000	1000	1000
5	10	14	125	0	400	333	143	500	200	667	500	1000	1000	1000
6	14	25	56	188	400	556	429	500	400	667	833	1000	1000	1000

Same as matrix 3

Visibility matrix for wind NNW

MATRIX HALFWORD SAVEVALUE DSTN

			Hold Areas					Secondary Airport												
	ROW		COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Logan Runways	1	4	34	25	19	31	49	27	36	46	39	46	22	29	55	12	33	14	30	38
	2	27	39	45	41	18	33	16	22	37	31	25	22	29	34	12	33	14	30	38
	3	22	33	45	41	20	26	26	16	38	43	23	47	36	28	43	45	35	49	24
	4	33	50	29	25	20	44	43	35	68	63	43	29	20	40	26	29	30	32	49
	5	15	25	32	47	41	26	16	22	37	31	25	36	51	34	34	55	35	52	17
	6		101	101	101	101	101	106	107	108	109	110	111	112	113	114	115	116	117	118

Airport definition matrix number (Row)

Distance from hold area/secondary airport to Logan in a radar environment

Column Headings

1	Manjo	10	Lawrence
2	Millis	11	Mansfield
3	Bridgewater	12	Marshfield
4	Skipper	13	Newburyport
5	LWM	14	Norwood
6	Bedford	15	Plymouth
7	Beverly	16	S. Weymouth
8	Fitchburg	17	Taunton
9	Ft. Devens	18	Tew-Mac

(continued)

MATRIX HALFWORD SAVEVALUEDSTNR

	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ROW 1	26	49	39	55	26	15	14	38	49	27	34	31	27	28	31	28	45	24
2	38	39	39	38	36	38	21	62	55	38	45	31	35	38	42	28	45	35
3	26	38	46	26	43	28	14	49	45	27	55	41	27	48	52	38	55	24
4	19	18	29	25	39	45	35	60	62	51	34	21	48	28	31	17	34	45
5	27	38	29	44	27	15	24	38	48	28	42	55	38	28	58	38	52	17

Same as DSTN matrix

Distance from hold area/secondary airport to Logan in a non-radar environment

MATRIX HALFWORD SAVEVALUEVFRAC

		Hold Areas				Secondary Airports													
	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Default to Tew Mac
ROW 1	297	597	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	7	
2	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	6	
3	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	6	
4	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	8	
5	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	11	
6	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	17	
7	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	25	
8	260	522	740	784	871	871	871	954	955	955	955	955	955	998	998	1000	1000	30	
9	251	502	711	752	836	929	946	947	948	954	954	955	955	996	997	998	999	41	
10	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	40	
11	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	39	
Time of Day 12	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	40	Number of aircraft created in VFR conditions
13	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	46	
14	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	46	
15	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	40	
16	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	53	
17	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	60	
18	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	43	
19	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	53	
20	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	46	
21	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	33	
22	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	26	
23	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	7	
24	269	538	763	807	897	997	997	997	998	998	998	998	998	998	998	1000	1000	12	

(continued)

MATRIX HALFWORD SAVEVALUEIFRAC

	COL. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ROW 1	297	597	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	3
2	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	5
3	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	5
4	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	7
5	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	9
6	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	14
7	299	598	847	897	996	996	996	996	997	997	997	997	997	997	997	1000	1000	20
8	260	522	740	784	871	871	871	954	955	955	955	955	955	998	998	1000	1000	24
9	251	502	711	752	836	929	946	947	948	954	954	955	955	996	997	998	999	33
10	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	32
11	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	30
12	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	32
13	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	37
14	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	37
15	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	31
16	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	43
17	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	48
18	251	502	710	752	836	928	946	947	948	954	955	955	955	996	997	998	999	35
19	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	43
20	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	37
21	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	27
22	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	20
23	258	516	731	774	860	955	955	955	956	956	956	956	956	998	998	1000	1000	6
24	269	538	763	807	897	997	997	997	998	998	998	998	998	998	998	1000	1000	10

Same as VFRAC matrix, but in IFR conditions

MATRIX HALFWORD SAVEVALUECATWT

		COL. 1	2	3	4	5	6	7	
ROW	1	0	0	787	1000	0	787	1000	Air Carrier
	2	0	1000	1000	1000	0	1000	1000	Air Taxi
A/C	3	1000	1000	1000	1000	1000	1000	1000	General Aviation
Type	4	300	500	1000	1000	500	1000	1000	Military
		Approach Category				Weight Class			

Matrix is used to define aircraft category and weight, once type has been determined

(continued)

MATRIX HALFWORD SAVEVALUEVFRPT

A/C Destinations	ROW	COL. 1	2	3
	1	782	897	996
	2	782	897	996
	3	782	897	996
	4	782	897	996
	5	782	897	996
	6	30	111	947
	7	0	2	816
	8	0	0	1000
	9	0	0	38
	10	0	190	1000
	11	0	0	1000
	12	0	0	1000
	13	0	0	1000
	14	2	11	869
	15	0	0	1000
	16	0	0	174
	17	0	0	1000
	18	0	235	1000

A/C Type (Default = type 4)

Matrix is used to determine aircraft type once destination is known in VFR conditions
(Entries signify occurrences out of 1000)

MATRIX HALFWORD SAVEVALUEIFRPT

ROW	COL. 1	2	3
1	782	897	996
2	782	897	996
3	782	897	996
4	782	897	996
5	782	897	996
6	30	111	947
7	0	2	816
8	0	0	1000
9	0	0	38
10	0	190	1000
11	0	0	1000
12	0	0	1000
13	0	0	1000
14	2	11	869
15	0	0	1000
16	0	0	174
17	0	0	1000
18	0	235	1000

Same as VFRPT matrix, but in IFR conditions

MATRIX HALFWORD SAVEVALUEARSEP

	ROW	COL. 1	2	3	4	5	6	7	8	9	10	11
Radar Conditions	1	37	39	40	38	3	1	2	3	0	1	20
	2	37	39	40	0	3	1	2	3	0	1	20
	3	37	39	0	38	3	1	2	3	0	1	16
	4	37	39	0	0	3	1	2	3	0	1	16
	5	37	0	40	38	4	0	1	2	0	0	10
	6	37	0	40	0	4	0	1	2	0	0	10
	7	37	0	0	38	4	0	1	2	0	0	12
	8	37	0	0	0	4	0	1	2	0	0	12
	9	0	39	40	38	3	1	2	3	0	1	20
	10	0	39	40	0	3	1	2	3	0	1	20
	11	0	39	0	38	5	0	0	1	0	0	16
	12	0	39	0	0	5	0	0	1	0	0	16
	13	0	0	40	38	5	0	0	1	0	0	10
	14	0	0	0	38	5	0	0	1	0	0	8
Non-Radar Conditions	15	0	0	40	0	12	0	0	1	0	0	10
	16	0	0	0	0	12	0	0	1	0	0	8

Columns 1–4: Equipment required up to determine which separation criteria to use (row number)

Column 5: Required separation in miles

Columns 6–10: Additional separation in miles for various weights of aircraft

Column 11: Number of aircraft air control can handle at one time

(continued)

MATRIX HALFWORD SAVEVALUEDELAY

ROW	COL. 1	2	3	4
1	515	64	160	12
2	514	56	87	8
3	0	0	21	4
4	0	0	462	83
5	356	33	60	4
6	7419	801	1418	91
7	4694	629	968	49
8	51	9	6	2
9	462	47	81	6
10	346	29	56	2
11	1252	80	153	2
12	39	2	4	0
13	461	44	81	2

See accompanying explanation of rows

Aircraft Type

1. Number of aircraft created at holding fixes and secondary airports
2. Number of aircraft originally scheduled to the primary airport through the holding fixes
3. Number of aircraft diverted from secondary airport to primary airport
4. Time of flight accumulated by secondary-airport aircraft diverted to the primary airport
5. Number of aircraft landing at primary airport that experienced delay
6. Total delay of landing aircraft
7. Total delay accumulated, for both landing and diverting aircraft, due to separation criteria
8. Number of aircraft not able to land at primary airport and diverted
9. Number of aircraft that landed at primary airport
10. Number of aircraft that experienced takeoff delay at primary airport
11. Total takeoff delay time
12. Total takeoff delay time experienced by aircraft at head of takeoff queue waiting to achieve separation on aircraft taking off ahead
13. Number of aircraft entering the takeoff queue

Figure 3-6. OUTPUT DELAY MATRIX

(continued)

Logan Definition Matrix

MATRIX HALFWORD SAVEVALUEAIR01

ROW	COL. 1	2	3	4
1	18	0	24	19
2	13	7	23	7
3	1	40	133	1
4	1	40	134	1
5	2	270	135	1
6	2	270	136	1
7	3	220	137	1
8	3	220	138	1
9	4	330	139	1
10	4	330	140	1
11	5	150	141	1
12	5	150	142	1
13	4	330	139	1
14	4	330	140	1
15	1	40	133	1
16	1	40	134	1
17	3	220	137	1
18	3	220	138	1

Number of rows in this matrix

Operating hours of Logan

Daylight hours definition

Elevation in feet

Number of approaches

Day runway priorities

Night runway priorities

Matrix number of minima matrix

Matrix number of approach definition matrix

Row in which night runway selections starts

Runway number (user-assigned)

Runway direction in degrees

Airport Definition Matrix (General Case)					
	Row \ Column	1	2	3	4
	1	Number of Rows (n)	Opening Time	Closing Time	Elevation (in feet)
	2	Night Runways (M)	Day Start	Night Start	Number of Approaches
Day matrix	3 . . . M-1	Runway Number (Consecutive)	Runway Direction (Degrees)	Approach Matrix Number	Minima Matrix Number
Night matrix	M . . . n				

(continued)

MATRIX HALFWORD SAVEVALUEAIR02

	COL. 1	2	3	4
ROW 1	6	7	24	133
2	6	0	24	5
3	1	110	143	2
4	2	290	156	2
5	3	230	156	2
6	4	50	156	2

Same as matrix AIR01

Bedford definition matrix

MATRIX HALFWORD SAVEVALUE 107

	COL. 1	2	3	4
ROW 1	6	8	18	108
2	6	0	24	4
3	1	160	144	3
4	2	340	144	3
5	3	90	144	3
6	4	270	144	3

Same as matrix AIR01

Beverly definition matrix

MATRIX HALFWORD SAVEVALUE 108

	COL. 1	2	3	4
ROW 1	5	8	18	350
2	5	0	24	1
3	1	140	145	4
4	2	320	145	4
5	3	200	145	4

Same as matrix AIR01

Fitchburg definition matrix

MATRIX HALFWORD SAVEVALUE 109

	COL. 1	2	3	4
ROW 1	6	0	24	268
2	6	0	24	1
3	1	140	146	5
4	2	320	146	5
5	3	20	146	5
6	4	200	146	5

Same as matrix AIR01

Ft. Devens definition matrix

(continued)

MATRIX HALFWORD SAVEVALUE 110

	COL. 1	2	3	4
ROW 1	6	8	21	147
2	6	0	24	2
3	1	230	147	6
4	2	50	157	6
5	3	140	158	6
6	4	320	158	6

Same as matrix AIR01

Lawrence definition matrix

MATRIX HALFWORD SAVEVALUE 111

	COL. 1	2	3	4
ROW 1	4	8	18	124
2	4	0	24	2
3	1	140	148	7
4	2	320	148	7

Same as matrix AIR01

Mansfield definition matrix

MATRIX HALFWORD SAVEVALUE 112

	COL. 1	2	3	4
ROW 1	4	8	18	9
2	4	0	24	1
3	1	60	149	8
4	2	240	149	8

Same as matrix AIR01

Marshfield definition matrix

MATRIX HALFWORD SAVEVALUE 113

	COL. 1	2	3	4
ROW 1	4	8	18	11
2	4	0	24	1
3	1	100	150	9
4	2	280	150	9

Same as matrix AIR01

Newburyport definition matrix

(continued)

MATRIX HALFWORD SAVEVALUE 114

	COL. 1	2	3	4
ROW 1	6	7	23	49
2	6	0	24	4
3	1	350	151	10
4	2	170	151	10
5	3	100	151	10
6	4	280	151	10

Same as matrix AIR01

Norwood definition matrix

MATRIX HALFWORD SAVEVALUE 115

	COL. 1	2	3	4
ROW 1	6	8	18	149
2	6	0	24	1
3	1	60	152	11
4	2	330	152	11
5	3	240	152	11
6	4	150	152	11

Same as matrix AIR01

Plymouth definition matrix

MATRIX HALFWORD SAVEVALUE 116

	COL. 1	2	3	4
ROW 1	6	0	24	161
2	6	0	24	3
3	1	350	153	12
4	2	80	159	12
5	3	260	160	12
6	4	170	161	12

Same as matrix AIR01

S. Weymouth definition matrix

MATRIX HALFWORD SAVEVALUE 117

	COL. 1	2	3	4
ROW 1	4	8	18	92
2	4	0	24	3
3	1	300	154	13
4	2	120	154	13

Same as matrix AIR01

Taunton definition matrix

MATRIX HALFWORD SAVEVALUE 118

	COL. 1	2	3	4
ROW 1	6	8	18	92
2	6	0	24	2
3	1	210	155	14
4	2	30	155	14
5	3	180	155	14
6	4	360	155	14

Same as matrix AIR01

Tew-Mac definition matrix

(continued)

MATRIX HALFWORD SAVEVALUEAIR03

		COL. 1	2	3	4	5	6	7	8
ROW	1	2	4	0	0	0	0	0	0
Approaches	2	4	7	0	0	0	0	0	0
	3	15	10	7	0	19	23	56	43
	4	15	7	0	0	0	0	56	43
	5	35	0	0	0	15	0	56	0
	6	15	7	35	0	0	0	0	0
	7	37	0	0	0	0	0	0	0

Facility number required up for approach to be used

HIRL facility number (if required by approach)

ALS facility number (if required by approach)

Middle marker facility number (if required by approach)

Outer marker facility number (if required by approach)

Approach Definition Matrixes
(matrix AIR03 to matrix 161)

MATRIX HALFWORD SAVEVALUE 134

		COL. 1	2	3	4	5	6	7	8
ROW	1	2	4	0	0	0	0	0	0
	2	4	7	0	0	0	0	0	0
	3	15	2	3	0	19	23	56	43
	4	15	2	3	10	0	0	56	43
	5	35	0	0	0	19	0	56	0
	6	15	2	3	0	0	0	0	0
	7	37	0	0	0	0	0	0	0

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 135

		COL. 1	2	3	4	5	6	7	8
ROW	1	4	7	0	0	0	0	0	48
	2	4	7	0	0	0	0	0	0
	3	16	11	2	3	20	24	0	0
	4	16	7	0	0	0	0	0	0
	5	7	0	0	0	0	0	0	0
	6	15	2	3	35	0	0	0	0
	7	37	0	0	0	0	0	0	0

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 136

		COL. 1	2	3	4	5	6	7	8
ROW	1	4	2	0	0	0	0	0	48
	2	4	7	0	0	0	0	0	0
	3	16	11	2	3	20	24	0	0
	4	16	7	0	0	0	0	0	0
	5	7	0	0	0	20	0	0	0
	6	15	7	35	0	0	0	0	0
	7	37	0	0	0	0	0	0	0

Same as matrix AIR03

(continued)

MATRIX HALFWORD SAVEVALUE 137

	COL. 1	2	3	4	5	6	7	8
ROW 1	2	4	0	0	0	0	0	0
2	2	4	7	0	0	0	0	44
3	15	10	7	0	19	23	0	0
4	15	7	0	0	0	0	0	0
5	35	0	0	0	19	0	0	0
6	35	15	7	0	0	0	0	44
7	37	0	0	0	0	0	0	0

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 138

	COL. 1	2	3	4	5	6	7	8
ROW 1	2	4	0	0	0	0	0	0
2	2	4	0	0	0	0	0	44
3	15	2	3	10	19	23	0	0
4	15	2	3	0	0	0	0	0
5	35	0	0	0	19	0	0	0
6	15	2	3	0	0	0	0	44
7	37	0	0	0	0	0	0	0

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 139

	COL. 1	2	3	4	5	6	7	8
ROW 1	4	7	0	0	0	0	57	46
2	4	7	0	0	0	0	0	0
3	16	11	2	3	20	24	57	0
4	[illegible]	7	0	0	0	0	0	0
5	7	0	0	0	20	0	57	0
6	15	2	3	35	0	0	0	0
7	37	0	0	0	0	0	0	0

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 140

	COL. 1	2	3	4	5	6	7	8
ROW 1	2	4	0	0	0	0	57	46
2	7	4	0	0	0	0	0	0
3	7	16	11	0	20	24	57	0
4	7	16	0	0	0	0	0	0
5	7	0	0	0	20	0	57	0
6	7	15	35	0	0	0	0	0
7	37	0	0	0	0	0	0	0

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 141

	COL. 1	2	3	4	5	6	7	8
ROW 1	4	7	0	0	0	0	0	0
2	4	7	0	0	0	0	0	45
3	14	7	9	0	18	22	0	0
4	14	7	0	0	0	0	0	45
5	0	0	0	0	0	0	0	0
6	15	7	35	0	0	0	0	0
7	37	0	0	0	0	0	0	0

Same as matrix AIR03

(continued)

MATRIX HALFWORD SAVEVALUE 142

	COL. 1	2	3	4	5	6	7	8
ROW 1	4	2	0	0	0	0	0	0
2	4	7	0	0	0	0	0	45
3	14	2	1	9	18	22	0	0
4	14	2	1	0	0	0	0	45
5	0	0	0	0	0	0	0	0
6	15	2	1	35	0	0	0	0
7	37	0	0	0	0	0	0	0

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 143

	COL. 1	2	3	4	5	6	7	8
ROW 1	53	0	0	0	17	0	0	0
2	12	8	1	0	17	21	0	64
3	12	1	0	0	17	0	0	0
4	4	53	0	0	17	0	0	0
5	1	4	0	0	0	0	0	0

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 144

	COL. 1	2	3	4	5	6	7	8
ROW 1	25	0	0	0	0	0	0	0
2	4	3	6	0	0	0	0	0
3	4	33	1	0	0	0	0	0
4	4	33	1	1	0	0	0	0

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 145

	COL. 1	2	3	4	5	6	7	8
ROW 1	32	0	0	0	0	0	0	0

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 146

	COL. 1	2	3	4	5	6	7	8
ROW 1	26	0	0	0	0	0	0	0

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 147

	COL. 1	2	3	4	5	6	7	8
ROW 1	1	3	0	0	0	0	0	41
2	13	28	0	0	0	0	0	0

Same as matrix AIR03

(continued)

MATRIX HALFWORD SAVEVALUE 148

	COL. 1	2	3	4	5	6	7	8
ROW 1	2	0	0	0	0	0	0	0
2	2	5	0	0	0	0	0	0

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 149

	COL. 1	2	3	4	5	6	7	8
ROW 1	2	5	0	0	0	0	0	0

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 150

	COL. 1	2	3	4	5	6	7	8
ROW 1	13	17	0	0	0	0	0	0

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 151

	COL. 1	2	3	4	5	6	7	8
ROW 1	31	0	0	0	0	0	0	0
2	31	34	0	52	0	0	0	0
3	2	0	0	0	0	0	0	0
4	2	5	0	0	0	0	0	0

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 152

	COL. 1	2	3	4	5	6	7	8
ROW 1	30	0	0	0	0	0	0	0

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 153

	COL. 1	2	3	4	5	6	7	8
ROW 1	27	0	0	0	0	0	0	0
2	2	5	0	0	0	0	0	0
3	2	5	36	0	0	0	0	61

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 154

	COL. 1	2	3	4	5	6	7	8
ROW 1	29	0	0	0	0	0	0	0
2	2	0	0	0	0	0	0	0
3	2	5	0	0	0	0	0	0

Same as matrix AIR03

(continued)

MATRIX HALFWORD SAVEVALUE 155

		COL. 1	2	3	4	5	6	7	8
ROW	1	1	3	0	0	0	0	0	0
	2	28	0	0	0	0	0	0	0

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 156

		COL. 1	2	3	4	5	6	7	8
ROW	1	53	0	0	0	17	0	0	0
	2	1	12	6	0	17	0	0	0
	3	1	12	0	0	17	0	0	0
	4	4	53	0	0	17	0	0	0
	5	4	1	0	0	0	0	0	0

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 157

		COL. 1	2	3	4	5	6	7	8
ROW	1	1	3	0	0	0	0	0	0
	2	13	28	0	0	0	0	0	41

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 158

		COL. 1	2	3	4	5	6	7	8
ROW	1	1	3	0	0	0	0	0	0
	2	13	28	0	0	0	0	0	0

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 159

		COL. 1	2	3	4	5	6	7	8
ROW	1	27	0	0	0	0	0	0	0
	2	2	5	0	0	0	0	0	0
	3	2	5	36	0	0	0	0	58

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 160

		COL. 1	2	3	4	5	6	7	8
ROW	1	27	0	0	0	0	0	0	0
	2	2	5	0	0	0	0	0	0
	3	2	5	36	0	0	0	62	59

Same as matrix AIR03

MATRIX HALFWORD SAVEVALUE 161

		COL. 1	2	3	4	5	6	7	8
ROW	1	27	0	0	0	0	0	0	0
	2	2	5	0	0	0	0	0	0
	3	2	5	36	0	0	0	0	0

Same as matrix AIR03

(continued)

MATRIX FULLWORD SAVEVALUE MINMA

Approach Type	ROW	A/C Category	COLUMN 1 (4R)	2 (27)	3 (22L)	4 (33L)	5 (15R)
VOR 1	1	1	680100	460100	680100	680100	680100
	2	2	680100	460100	680100	680100	680100
	3	3	820150	460100	820150	820150	820150
	4	4	820200	460100	820200	820200	820200
VOR DME 2	5	1	680100	680100	560100	680100	780100
	6	2	680100	680100	560100	680100	780125
	7	3	820150	820150	560100	820150	780150
	8	4	820200	820200	560125	820200	780175
ILS 3	9	1	216050	680100	680100	680100	268075
	10	2	216050	680100	680100	680100	268075
	11	3	216050	820150	820150	820150	268075
	12	4	216050	820200	820200	820200	268075
LOC 4	13	1	460075	680100	680100	680100	580100
	14	2	460075	680100	680100	680100	580100
	15	3	460075	820150	820150	820150	580100
	16	4	460075	820200	820200	820200	580125
NDB 5	17	1	680100	680100	680100	680100	680100
	18	2	680100	680100	680100	680100	680100
	19	3	820150	820150	820150	820150	820150
	20	4	820200	820200	820200	820200	820200
LOC BC 6	21	1	680100	680100	420100	680100	680100
	22	2	680100	680100	420100	680100	680100
	23	3	820150	820150	420100	820150	820150
	24	4	820200	820200	420100	820200	820200
ASR 7	25	1	620050	460100	540100	480050	800100
	26	2	620050	460100	540100	480050	800175
	27	3	620050	460100	540100	480050	800150
	28	4	620100	460100	540125	480100	800175

Runway Number

Approach Type

A/C Category

Minimum ceiling requirement (in feet)

Minimum visibility requirement (in 100ths of a mile)

Logan Minima Matrix

MATRIX FULLWORD SAVEVALUE 2

ROW	COLUMN 1	2	3	4
1	700100	700100	700100	700100
2	700100	700100	700100	700100
3	700100	720150	720150	720150
4	700125	760200	760200	760200
5	383100	0	0	0
6	383100	0	0	0
7	383100	0	0	0
8	383100	0	0	0
9	660100	680100	680100	680100
10	660100	680100	680100	680100
11	660100	720150	720150	720150
12	660125	760200	760200	760200
13	800100	800100	800100	800100
14	800100	800100	800100	800100
15	800150	800125	800150	800150
16	800200	800150	800200	800200
17	680100	680100	680100	680100
18	680100	680100	680100	680100
19	720150	680100	680100	720150
20	760200	760200	680125	760200

Same as matrix MINMA

Bedford Minima Matrix

(continued)

MATRIX FULLWORD SAVEVALUE 3

	COLUMN 1	2	3	4
ROW 1	600100	600100	600100	600100
2	600100	600100	600100	600100
3	600150	600150	600150	600150
4	700200	700200	700200	700200
5	640100	640100	640100	640100
6	640100	640100	640100	640100
7	640100	640150	640150	640150
8	640125	700200	700200	700200
9	580100	600100	600100	600100
10	580100	600100	600100	600100
11	580100	600150	600150	600150
12	580100	700200	700200	700200
13	500100	600100	600100	600100
14	500100	600100	600100	600100
15	500100	600150	600150	600150
16	500100	700200	700200	700200

Same as matrix MINMA

Beverly Minima Matrix

MATRIX FULLWORD SAVEVALUE 4

	COLUMN 1	2	3	4
ROW 1	1140100	1140100	1140100	1140100
2	1400175	1400175	1400175	1400175
3	1420200	1420200	1420200	1420200
4	1600200	1600200	1600200	1600200

Same as matrix MINMA

Fitchburg Minima Matrix

MATRIX FULLWORD SAVEVALUE 5

	COLUMN 1	2	3	4
ROW 1	940100	940100	940100	940100
2	940100	940100	940100	940100
3	940125	940150	940150	940150
4	940150	940200	940200	940200

Same as matrix MINMA

Ft. Devens Minima Matrix

MATRIX FULLWORD SAVEVALUE 6

	COLUMN 1	2	3	4
ROW 1	700100	780100	780100	780100
2	700100	780100	780100	780100
3	700100	780150	780150	780150
4	700125	780200	780200	780200
5	780100	760100	780100	780100
6	780100	760100	780100	780100
7	780150	760100	780125	780125
8	780200	760125	780200	780200

Same as matrix MINMA

Lawrence Minima Matrix

(continued)

MATRIX FULLWORD SAVEVALUE 7

	COLUMN 1	2
ROW 1	860100	860100
2	860100	860100
3	860150	860150
4	860200	860200
5	780100	780100
6	780100	780100
7	780150	780150
8	800200	800200

Same as matrix MINMA

Mansfield Minima Matrix

MATRIX FULLWORD SAVEVALUE 8

	COLUMN 1	2
ROW 1	600100	600100
2	600100	600100
3	600150	600150
4	640200	640200

Same as matrix MINMA

Marshfield Minima Matrix

MATRIX FULLWORD SAVEVALUE 9

	COLUMN 1	2
ROW 1	740100	740100
2	1500500	1500500
3	1500500	1500500
4	1500500	1500500

Same as matrix MINMA

Newburyport Minima Matrix

MATRIX FULLWORD SAVEVALUE 10

	COLUMN 1	2	3	4
ROW 1	640100	640100	640100	640100
2	640100	640100	640100	640100
3	640100	640150	640150	640150
4	640125	740200	740200	740200
5	580100	640100	640100	640100
6	580100	640100	640100	640100
7	580100	640150	640150	640150
8	580125	740200	740200	740200
9	840100	840100	840100	840100
10	840125	840125	840125	840125
11	840150	840150	840150	840150
12	840175	840175	840175	840175
13	580100	0	0	0
14	580100	0	0	0
15	580100	0	0	0
16	580125	0	0	0

Same as matrix MINMA

Norwood Minima Matrix

(continued)

MATRIX FULLWORD SAVEVALUE 11

	COLUMN 1	2	3	4
ROW 1	600100	600100	600100	600100
2	600100	600100	600100	600100
3	600100	600150	600150	600150
4	1500500	1500500	1500500	1500500

Same as matrix MINMA

Plymouth Minima Matrix

MATRIX FULLWORD SAVEVALUE 12

	COLUMN 1	2	3	4
ROW 1	620100	640100	640100	640100
2	620100	640100	640100	640100
3	620100	640150	640150	640150
4	620100	720200	720200	720200
5	640100	640100	640100	640100
6	640100	640100	640100	640100
7	640150	640150	640150	640150
8	720200	720200	720200	720200
9	520100	540100	560100	640100
10	520100	540100	560100	640100
11	520100	540100	560100	640150
12	520100	540100	560100	720200

Same as matrix MINMA

S. Weymouth Minima Matrix

MATRIX FULLWORD SAVEVALUE 13

	COLUMN 1	2
ROW 1	660100	660100
2	660100	660100
3	660100	660150
4	660125	660200
5	760150	760150
6	760150	760150
7	760150	760150
8	760200	760200
9	580150	580150
10	620150	620150
11	620150	620150
12	620200	620200

Same as matrix MINMA

Taunton Minima Matrix

MATRIX FULLWORD SAVEVALUE 14

	COLUMN 1	2	3	4
ROW 1	640100	640100	640100	640100
2	640100	640100	640100	640100
3	640100	640150	640150	640150
4	640175	920200	920200	920200
5	760100	760100	760100	760100
6	760100	760100	760100	760100
7	760150	760150	760150	760150
8	920200	920200	920200	920200

Same as matrix MINMA

Tew-Mac Minima Matrix

(continued)

AD-A058 984 ARINC RESEARCH CORP ANNAPOLIS MD F/G 1/5
USER DELAY COST MODEL AND FACILITIES MAINTENANCE COST MODEL FOR--ETC(U)
MAY 78 L B GREENE, J WITT DOT-TSC-1173-2
UNCLASSIFIED FAA-AAF-220-78-01-2 NL

3 OF 3
AD
A058984

END
DATE
FILMED
11-78
DDC

OF 3

58984

1.0 2.8 2.5 3.2 2.2 3.6 4.0 2.0 1.1 1.8 1.25 1.4 1.6

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

MAT

RO

Facility Number

EQ

ORD SAVEVALUE FACIL

MTBF in minutes

MTTR in minutes

Facility Status: 1-facility up; 0-facility down

COLUMN 1	2	3
1	60300	318
1	60300	318
1	60300	318
1	60300	318
1	72300	402
1	24600	534
1	24600	534
0	28500	1260
0	28500	1260
0	28500	1260
0	28500	1260
0	23400	900
0	23400	900
0	23400	900
0	23400	900
0	23400	900
0	111900	1920
0	111900	1920
0	111900	1920
0	111900	1920
0	130500	2580
0	130500	2580
0	130500	2580
0	130500	2580
0	2100000	660
0	2100000	660
0	2100000	660
0	2100000	660
0	2100000	660
0	2100000	660
0	2100000	660
0	2100000	660
0	2100000	660
0	2100000	660
0	2100000	660
0	24600	534
0	36300	96
0	5160	180
0	29100	120
0	20100	114
0	25200	780
0	25200	780
0	25200	780
0	25200	780
0	25200	780
0	25200	780
0	25200	780
0	25200	780
0	2100000	616
0	2100000	616
0	2100000	660
0	2100000	660
0	2100000	660
0	25200	780
0	25200	780
0	25200	780
0	25200	780
0	25200	780
0	25200	780
0	25200	780
0	25200	780
0	25200	780
0	25200	780

Facility Status Matrix

***** TOTAL RUN TIME (INCLUDING ASSEMBLY) = 19.13 MINUTES *****

DATE 11/01/76,CLOCK 02/20/35,DURATION 00/19/19

APPENDIX B

LIST OF REFERENCES

1. "Special Ceiling-Visibility Wind Tabulation" for Boston, for the period January 1970 to December 1974, National Climatic Center, Asheville, North Carolina.

2. "Seasonal and Annual Persistence of Surface Wind Direction by Wind Speed" at Binghamton, New York, for the period January 1960 to December 1964, National Climatic Center, Asheville, North Carolina.

3. "Duration of High Surface Wind Speeds" at Oscoda, Michigan AFB, for the period November 1950 to December 1970, National Climatic Center, Asheville, North Carolina.

4. "FAA Air Traffic Activity, Calendar Year 1975", March 1976, U.S. Department of Transportation, FAA, Office of Management Systems, Information and Statistics Division, Washington, D.C. 20591.

5. *Air Traffic Control*, 7110.65, 1 January 1976, U.S. Department of Transportation, FAA, Air Traffic Service, Washington, D.C. 20591.

6. "Instrument Approach Procedures", National Ocean Survey.

7. "Standard Operating Procedures", March 15, 1976, (BOS TWR 7110.35), Boston Tower, Logan International Airport, East Boston, Massachusetts.

8. "60-Nautical-Mile Video Map", ASR-7, National Ocean Survey, revised 4 February 1976, Boston (Logan International), Massachusetts.

9. "Performance Measurement System for Major Airports", November 1975, U.S. Department of Transportation, FAA, Air Traffic Service, Operation Research Branch, Washington, D.C. 20591.

10. "Air Navigation and Air Traffic Control Facility Performance and Availability" (RIS: SM 6040-20), Calendar Year 1975, FAA, Airway Facilities Service, Washington, D.C. 20591.

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